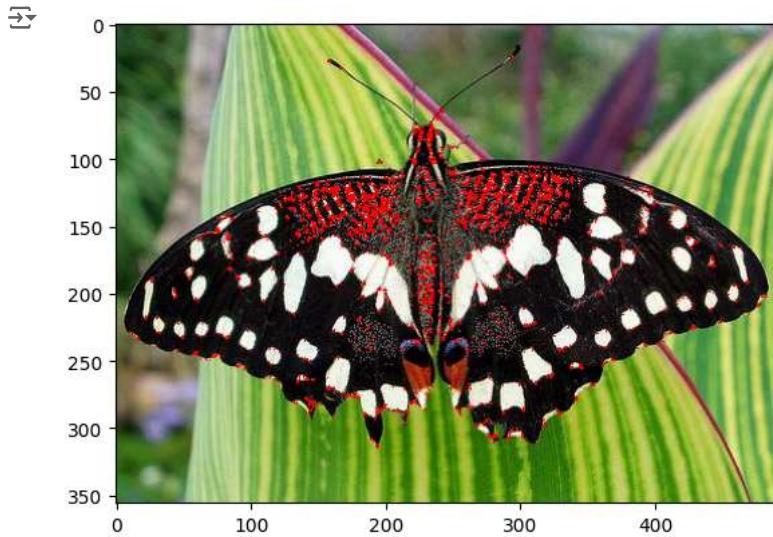


Qs 1: [2 Marks] Implement the Harris algorithm using OpenCV.

```
import cv2
import numpy as np
import matplotlib.pyplot as plt

def harris_corner_detection(image_path):
    img = cv2.imread(image_path)
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    gray = np.float32(gray)
    corners = cv2.cornerHarris(gray, 2, 3, 0.04)
    img[corners > 0.01 * corners.max()] = [0, 0, 255]
    plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
    plt.show()

harris_corner_detection('butterfly.jpg')
```



Qs 2: [2 Marks] Implement Image Pyramid using OpenCV.

```
import cv2
import matplotlib.pyplot as plt

def image_pyramid(image_path):
    img = cv2.imread(image_path)
    layer = img.copy()
    plt.figure(figsize=(10, 10))
    for i in range(3):
        plt.subplot(1, 3, i + 1)
        plt.imshow(cv2.cvtColor(layer, cv2.COLOR_BGR2RGB))
        plt.title(f'Level {i + 1}')
        plt.axis('off')
        layer = cv2.pyrDown(layer)
    plt.show()

image_pyramid('butterfly.jpg')
```



Qs 3:

- [3 Marks] Implement the SURF algorithm using OpenCV.

Or

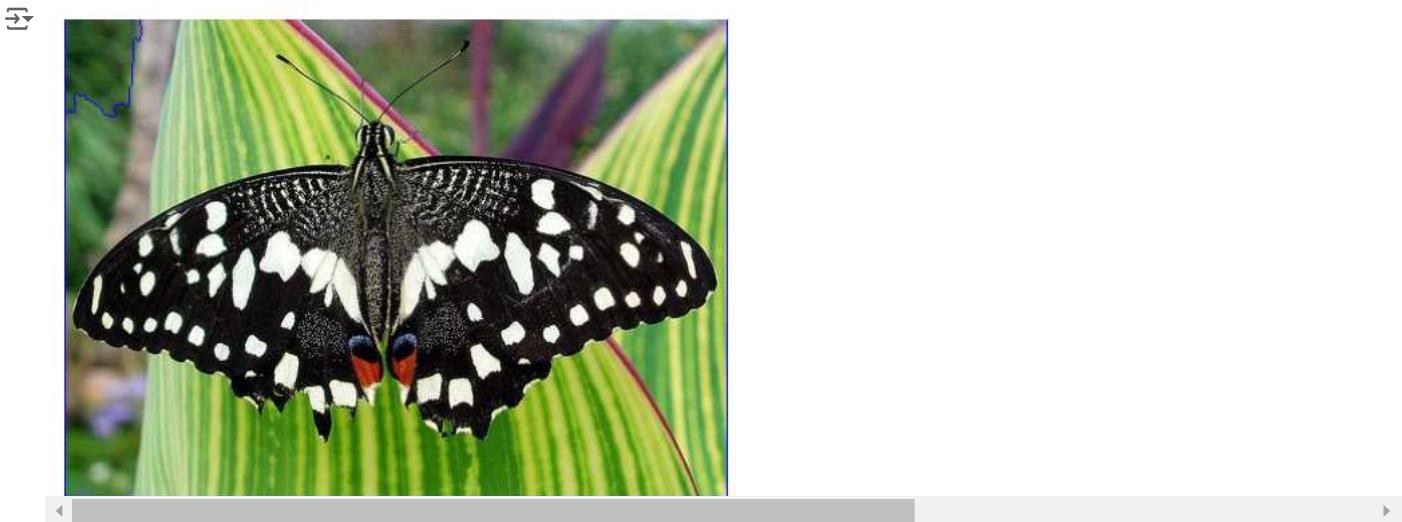
- [3 Marks] Implement Image Segmentation with Watershed Algorithm using OpenCV.

```
#Image segmentation with Watershed Algorithm

import cv2
import numpy as np
import matplotlib.pyplot as plt

def watershed_segmentation(image_path):
    img = cv2.imread(image_path)
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    _, thresh = cv2.threshold(gray, 0, 255, cv2.THRESH_BINARY_INV + cv2.THRESH_OTSU)
    kernel = np.ones((3, 3), np.uint8)
    opening = cv2.morphologyEx(thresh, cv2.MORPH_OPEN, kernel, iterations=2)
    sure_bg = cv2.dilate(opening, kernel, iterations=3)
    dist_transform = cv2.distanceTransform(opening, cv2.DIST_L2, 5)
    _, sure_fg = cv2.threshold(dist_transform, 0.7 * dist_transform.max(), 255, 0)
    sure_fg = np.uint8(sure_fg)
    unknown = cv2.subtract(sure_bg, sure_fg)
    _, markers = cv2.connectedComponents(sure_fg)
    markers += 1
    markers[unknown == 255] = 0
    markers = cv2.watershed(img, markers)
    img[markers == -1] = [255, 0, 0]
    plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
    plt.axis('off')
    plt.show()

watershed_segmentation('butterfly.jpg')
```

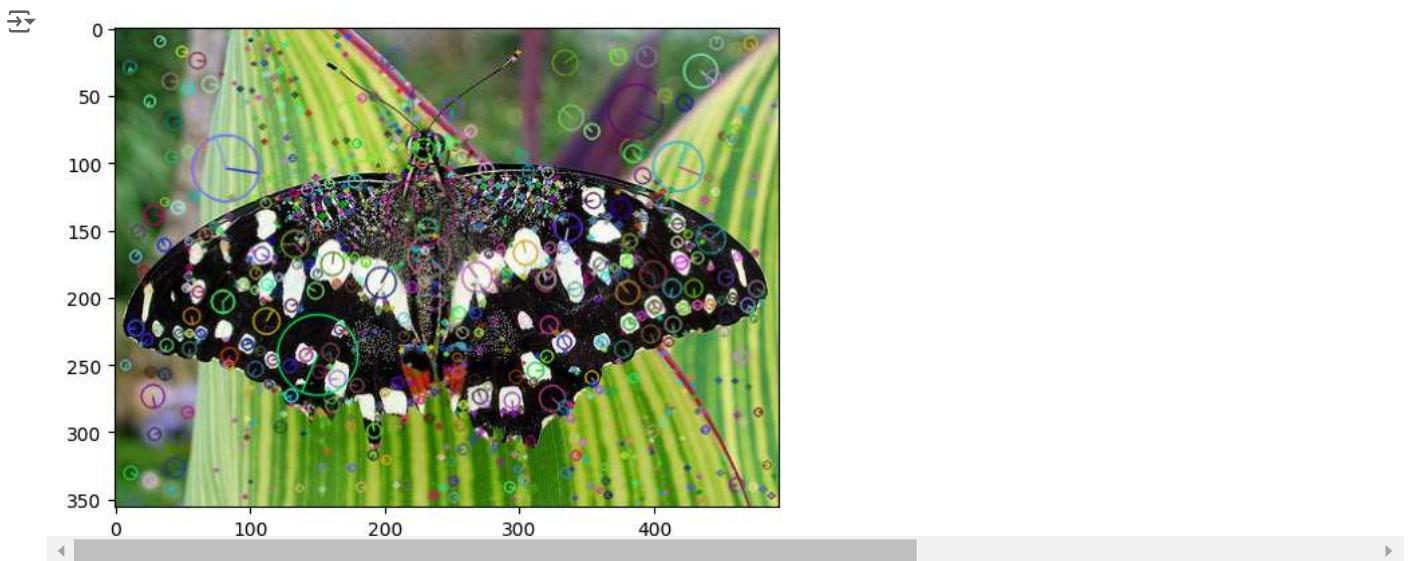


- Qs 4: [3 Marks] Implement SIFT algorithm using OpenCV.

```
import cv2
import matplotlib.pyplot as plt

def sift_algorithm(image_path):
    img = cv2.imread(image_path)
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    sift = cv2.SIFT_create()
    keypoints, descriptors = sift.detectAndCompute(gray, None)
    img_sift = cv2.drawKeypoints(img, keypoints, None, flags=cv2.DRAW_MATCHES_FLAGS_DRAW_RICH_KEYPOINTS)
    plt.imshow(cv2.cvtColor(img_sift, cv2.COLOR_BGR2RGB))
    plt.show()

sift_algorithm('butterfly.jpg')
```



Qs 5: [5 Marks] Implement object detection using YOLO on the COCO dataset. Provide the results for any 5 images (for testing purposes) from the dataset.

```
from ultralytics import YOLO
import cv2
import matplotlib.pyplot as plt

def yolo_object_detection(image_path):
    model = YOLO('yolov8n.pt')
    results = model(image_path)
    result_img = results[0].plot()
    plt.imshow(cv2.cvtColor(result_img, cv2.COLOR_BGR2RGB))
    plt.axis('off')
    plt.show()

for img_path in ['image1.jpg', 'cameraman.jpg', 'players.jpg', 'image2.jpg', 'image3.jpg']:
    yolo_object_detection(img_path)
```



image 1/1 c:\Users\Manju\Documents\Assignments\sem 2\AIDI1007 Vision Systems\image1.jpg: 384x640 1 cat, 1 dog, 98.5ms  
Speed: 3.0ms preprocess, 98.5ms inference, 2.0ms postprocess per image at shape (1, 3, 384, 640)



image 1/1 c:\Users\Manju\Documents\Assignments\sem 2\AIDI1007 Vision Systems\cameraman.jpg: 640x640 1 person, 138.1ms  
Speed: 3.0ms preprocess, 138.1ms inference, 2.0ms postprocess per image at shape (1, 3, 640, 640)



image 1/1 c:\Users\Manju\Documents\Assignments\sem 2\AIDI1007 Vision Systems\players.jpg: 448x640 3 persons, 2 sports balls, 113.1ms  
Speed: 3.0ms preprocess, 113.1ms inference, 4.0ms postprocess per image at shape (1, 3, 448, 640)

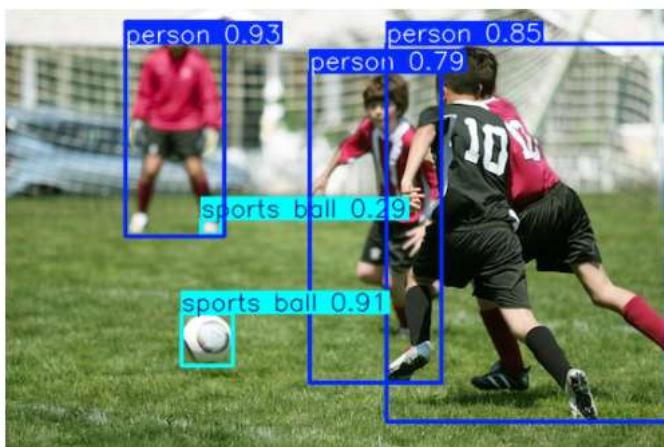


image 1/1 c:\Users\Manju\Documents\Assignments\sem 2\AIDI1007 Vision Systems\image2.jpg: 640x448 2 dogs, 106.0ms  
Speed: 2.0ms preprocess, 106.0ms inference, 2.0ms postprocess per image at shape (1, 3, 640, 448)

