The Superior University, Lahore

Assignment-I (Fall 2023)

Course Title:	Programming for AI				Course Code:	CAI601410	Credit Hours: 4
Instructor:	Prof. Rasikh Ali				Programme Name:	BSDS	
Semester:	4th	Batch:	F23	Section:	BSDSM-4A	Date:	1st February, 2025
Time Allowed:					Maximum Marks:		
Student's Name:	Asaad Iqbal				Reg. No.	SU92-BSDSM-F23-020	

Lab-Task 5

1: Animal Herd Detection System with alert on map

Task 1

Animal Herd Detection System

1. Introduction

The Animal Herd Detection System is a Python-based project designed to detect herds of animals in images or live video feeds and generate alerts on an interactive map. The system utilizes the YOLOv3 (You Only Look Once) object detection model to identify animals and Folium to create map-based alerts. It also integrates geolocation features to mark both the user's current location and the detected herd's location.

This document outlines the project's objectives, implementation, features, and usage. Spaces are provided for output screenshots to demonstrate the system's functionality.

2. Objectives

- **Detect Animal Herds:**
  - Utilize YOLOv3 to detect animals in images or video feeds.
  - Identify herds (≥3 animals of the same type).
- **Generate Map Alerts:**
  - Create an interactive map with markers for the detected herd and the user's location.
- **Geolocation Integration:**
  - Fetch the user's current location using IP-based geolocation or GPS hardware.
- **User-Friendly Interface:**
  - Provide an intuitive system for users to visualize results.

3. Tools and Technologies

Libraries Used

- **OpenCV:** Image processing and object detection.
- **NumPy:** Numerical computations.
- **Folium:** Creating interactive maps.
- **Geocoder:** Fetching the user's location via IP address.
- **Requests:** Making HTTP requests.
- **GPSD-Py3:** GPS hardware integration (optional).

YOLOv3 Model

- Pre-trained on the COCO dataset (80 classes, including animals).
- Required Files:
    - yolov3.cfg: YOLOv3 configuration file.
    - yolov3.weights: Pre-trained model weights.
    - coco.names: List of object class names.

4. Implementation

System Workflow

1. **Object Detection:**
    - Load the YOLOv3 model and detect animals in the input image.
    - Count the number of animals of each type.
2. **Geolocation:**
    - Fetch the user's current location using IP-based geolocation or GPS hardware.
3. **Map Alert:**
    - Create an interactive map with markers for both the detected herd and the user's location.
    - Save the map as map_alert.html.
4. **User Interface:**
    - Display the processed image with detected animals.
    - Print alerts in the console.

5. Features

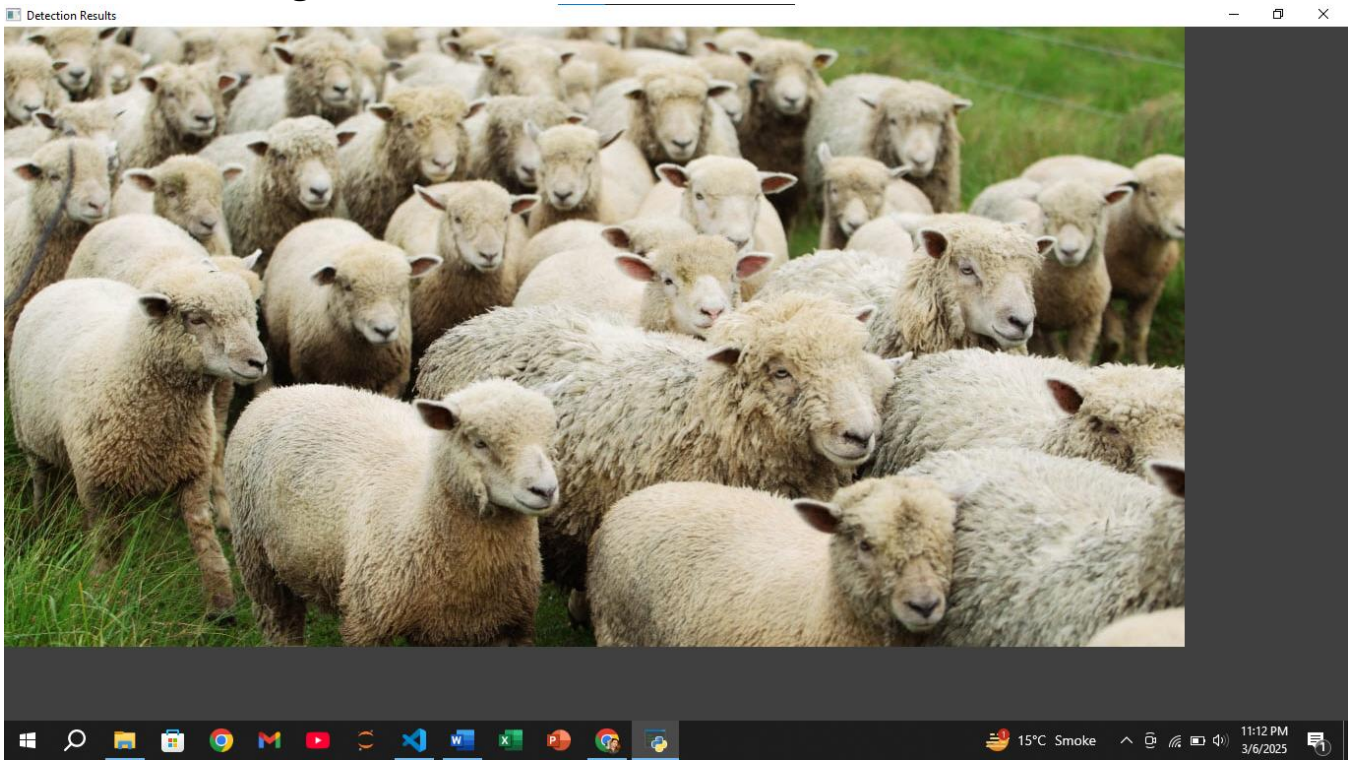
- **Animal Detection:**
    - Identifies animals like sheep, cows, and horses.
    - Highlights herds (≥3 animals of the same type).
- **Interactive Map:**
    - Displays the herd's location and the user's location.
    - Includes satellite view for better visualization.
- **Geolocation:**
    - Fetches the user's location automatically via IP address or GPS.
- **User-Friendly:**
    - Simple command-line interface.
    - Visual output with processed images and interactive maps.

6. Output

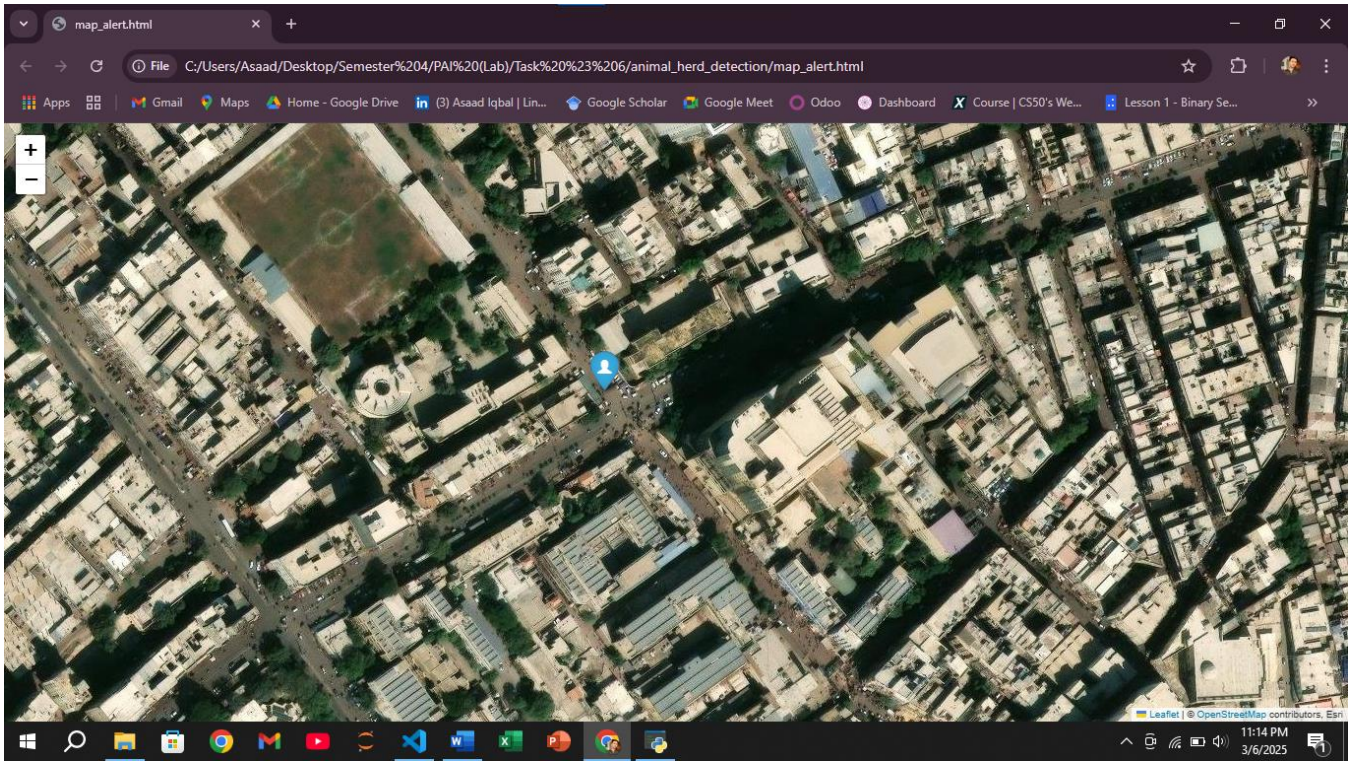
6.1 Console Output

```
PS C:\Users\Asaad\Desktop\Semester 4\PAI (Lab)\Task # 6\animal_herd_detection> & "C:/Program Files/Python312/python.exe" "c:/Users/Asaad/Desktop/Semester 4/PAI (Lab)/Task # 6/
animal_herd_detection/detection.py"
File 'C:\Users\Asaad\Desktop\Semester 4\PAI (Lab)\Task # 6\animal_herd_detection\sheep_herd.jpg' found.
Current location: 24.8608, 67.0104
HERD ALERT: 28 sheeps detected!
Map alert saved with coordinates: 24.8608, 67.0104
HERD ALERT: 3 cows detected!
Map alert saved with coordinates: 24.8608, 67.0104
```

6.2 Processed Image



6.3 Interactive Map



7. Conclusion

The Animal Herd Detection System is a powerful tool for identifying and alerting about animal herds in images or live feeds. It integrates object detection, geolocation, and interactive mapping to provide a comprehensive solution. The system is easy to use and can be extended for real-world applications such as wildlife monitoring and livestock management.