**Group:7**

# Report: Tracking Moving Objects in Videos Using Pure Machine Learning

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## 1. Introduction

In this project, we aim to develop a system that can track moving objects in videos using **pure machine learning (ML)**—without relying on deep learning models or OpenCV's built-in tracking algorithms. Our approach focuses on leveraging traditional supervised ML models such as **Support Vector Machines (SVM)** and **K-Nearest Neighbors (KNN)** for object detection, and **Kalman Filter** for motion prediction

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## 2. Dataset and Preprocessing

We collected 10 different videos from open sources (e.g., Pexels, YouTube) showing objects such as balls, vehicles, and people moving across the frame. Each video was processed using OpenCV to extract individual frames at a constant frame rate . These frames were stored with indexed filenames for sequential processing.

**Frame Information:**

Format: `.jpg`
Frame dimensions: Variable (standardized during processing)

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**Feature Extraction**

For each frame, we extracted simple visual features such as:

- Color histogram (for object color)

- Contour and bounding box (for object shape and location)

- Position (center X, Y), width, and height

**Object Detection**

To identify the object in each frame:

- **KNN** and **SVM** classifiers were trained to detect object regions based on the extracted features.

- Manual labeling was used for initial supervised training on a small number of frames.

- Detected objects were marked using bounding boxes and coordinates were stored.

### Tracking and Prediction

We used a **Kalman Filter** to track the object across frames and predict future positions, especially in cases of partial occlusion or motion blur.

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## Tools and Libraries

- **Python**

- **SVM and KNN models**

- **NumPy** – for numerical operations

- **OpenCV** – only used for reading videos, frame extraction, and drawing boxes

- **FilterPy** – for implementing Kalman Filter

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