Weekly Progress Report - Week 1

Multiple Object Tracking using Classical Machine Learning
for Re-Identification in UAV Videos

Group: Epochalypse
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Reporting Period: February 9 - February 14, 2026
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Outline of Performed Tasks:

- Reviewed reference materials provided by TA including CVPR 2025 paper, MOT metrics documentation, and GitHub repositories for Kalman Filter implementation, and BoxMOT framework
- Successfully downloaded and explored the AU Drone Dataset
- Studied classical tracking algorithms: SORT, Mean-Shift, CamShift, and Kalman Filtering

Project Overview

Problem Statement: Improve existing online trackers by measuring feature evolution of objects using Classical Machine Learning models for Re-Identification in UAV videos. This study evaluates Traditional Machine Learning for ReID in object tracking, moving away from deep learning. Instead of neural networks, it uses hand-crafted features like shape and color to create an object's identity.

Reference Materials Studied

1. Primary research paper from CVPR 2025:
   `https://cvpr.thecvf.com/virtual/2025/poster/35174`
2. MOT tracking metrics documentation:
   `https://miguel-mendez-ai.com/2024/08/25/mot-tracking-metrics`
3. GitHub repositories for implementation reference:
   - Multiple Object Tracking using Kalman Filter:
     `https://github.com/NickNair/Multiple-Object-Tracking-using-Kalman-Filter`
   - BoxMOT tracker framework:
     `https://github.com/mikel-brostrom/boxmot`

Classical Tracking Algorithms Studied

SORT (Simple Online and Realtime Tracking): Studied core architecture combining Kalman Filter for motion prediction and Hungarian algorithm for data association. Analyzed limitations related to appearance-based ReID.

Mean-Shift and CamShift Trackers: Examined color histogram-based tracking mechanisms and adaptive window sizing in CamShift for varying object scales in UAV scenarios.

Kalman Filtering: Reviewed mathematical foundations, prediction and update equations for motion modeling in object tracking context.

Outcomes:

- Understood classical tracking methods (SORT, Mean-Shift, CamShift) and Kalman Filtering
- Understood AU Drone Dataset structure

Tentative List of Tasks for Next Week:

1. Set up development environment (Python, OpenCV, PyTorch/TensorFlow, YOLO v8) and complete study of reference papers
2. Study feature extraction module (HOG, Color Histograms) and test on sample videos
3. Understand MOT evaluation metrics, (MOTA, MOTP, IDF1)
4. Start with dataset preprocessing pipeline for AU Drone Dataset