CSE541: Computer Vision
Weekly Progress Report - Week 1
Project Title: Robust Tracking in Synthetic Adverse Conditions

1. Summary of Work Done During Current Week

1.1 Understanding the Problem Statement and Defining Scope

During the first week, the primary objective was to thoroughly understand the project definition and objectives and define a clear technical direction for implementation. The project focuses on evaluating the robustness of UAV-based Multi-Object Tracking (MOT) systems under adverse environmental conditions such as heavy rain, fog, and dust, which are common challenges in Indian traffic scenarios.

Technical challenges identified:

- UAV imagery contains very small objects occupying limited pixel area.
- Dense traffic leads to heavy occlusion and cluttered backgrounds.
- Visibility degradation increases:
  - False negatives in detection
  - Identity switching in tracking pipelines.
- Need for synthetic data augmentation to simulate real-world atmospheric disturbances.

1.2 Literature Review and Technical Study
Found studies and research paper to the problem statement, found common practices and methodologies followed, and the current state of the results in the problem statement.

- [Multi-Object Tracking in UAV Videos: A YOLOv11 Fusion Method for Detection and Segmentation Optimization](#)
- [A Video-Based Real-Time Tracking Method for Multiple UAVs in Foggy Weather](#)
- [Adaptive Slicing-Aided Hyper Inference for Small Object Detection in High-Resolution Remote Sensing Images](#)
- [Slicing Aided Hyper Inference and Fine-tuning for Small Object Detection](#)

2. Tasks planned for the coming week

During Week 2, the focus will be on acquiring and understanding datasets for experimentation and conducting a more structured preliminary analysis.

Datasets found:

- AU Drone Dataset
- VisDrone Tracking Dataset

2.1 Development of Synthetic Weather Engine

- Implement augmentation module using Albumentations and OpenCV.
- Create parameterized augmentation pipeline:
- Low, Medium, High intensity weather conditions.
- Ensure bounding box annotations remain synchronized with augmented images.
- Generate augmented subsets of AU Drone dataset.

2.2 Establishing Baseline Evaluation Metrics

- Prepare TrackEval configuration files.

- Compute baseline metrics on clean dataset:

  - HOTA

  - MOTA

  - ID Switch Count

- Create scripts for automated metric logging across experiments.