Course Name: Machine Learning

Weekly Report: 2

Group Name: XYZ

Submitted to faculty:

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Work Done This Week

Dataset Exploration and Initial Processing

- We fully assessed the widely adopted VisDrone dataset during our study because it serves as the primary framework for aerial object detection and tracking. Our main objective in this stage was to learn how the dataset organized its structure as well as how labels were formatted and what condition the bounding box annotations were in.

Dataset Composition

- UAVs operating from different altitudes recorded both aerial images and video sequences within urban spaces at high image resolution.
- The dataset contains different object types consisting of pedestrians together with cars and bicycles alongside buses and trucks which appear densely distributed throughout the images resulting in numerous obstructions.
- Multi-object tracking (MOT) tasks benefit from this dataset because its annotation files include frame-wise bounding box coordinates together with object class labels and occlusion levels as well as visibility scores.
- The annotation tool includes two main elements: Bounding Box Visualization and Initial Analysis.
- The following procedure evaluates the dataset's annotation precision along with its capability to track objects:
- The system processed annotation files for box boundary information retrieval.
- A program was developed to display image bounding boxes which let users see how objects were positioned within the frames.
- This part of the research checked frame-to-frame object visibility by detecting instances where moving cameras block targets from view.
- The detection of objects turns into a difficult task because objects that are far away become smaller in comparison to nearby objects.

Challenges Noted

- The appearance of several obstructed objects along with short instances of full object concealment causes fragmented tracklets.
- The alteration in drone height causes one object to look bigger or smaller throughout back-to-back frame sequences.
- Multiple objects located in close proximity to each other create conditions for faulty object identification.
- Knowledge of these factors will enable better refinement of the tracking method and the selection of suitable reconstruction algorithms.

Next Steps: Algorithm Exploration

- We will study multiple tracking algorithms during the following week to handle the observed difficulties.
- Although the KD-Tree performs nearest-neighbor associations it offers efficient searches required for tracklet linkages.
- Kalman Filter: Motion-based predictions for maintaining object identities.
- The SIFT (Scale-Invariant Feature Transform) method utilizes features for object tracking to manage situations of occlusion.

This will provide insights into the best strategies for reconstructing complete and consistent object paths from fragmented tracklets.