Evaluate Performance of ReID-based Tracking algorithms using UAV videos

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Problem Statement

Improving Online Trackers via Feature Evolution Measurement

This study focuses on evaluating and enhancing the performance of ReID-based trackers in object tracking scenarios, particularly for UAV videos. Traditional immediate detection approaches may fail in challenging conditions, necessitating consideration of feature evolution over time.

- Existing trackers fac e limitations in scenarios with occlusions, viewpoint changes, and varying illumination conditions common in UAV footage
- ReID-based methods offer potential for robust tracking through temporal feature matching
- Current frameworks lack comprehensive integration of feature evolution metrics

Feedback Provided:

Expected to implement object detection using pretrained models as part of our pipeline. Make sure the ReID model can recover and correctly reassign the same ID to an object once it is lost and reappears in the scene.

What We Did:

- Used YOLOv8, a cutting-edge pretrained object detector, to accurately localize objects in UAV video frames.

- Used ResNet50 to extract feature embeddings and monitor identity consistency over time.

- Helped the tracker recover lost objects and reassign the correct ID upon reappearance, improving tracking robustness.
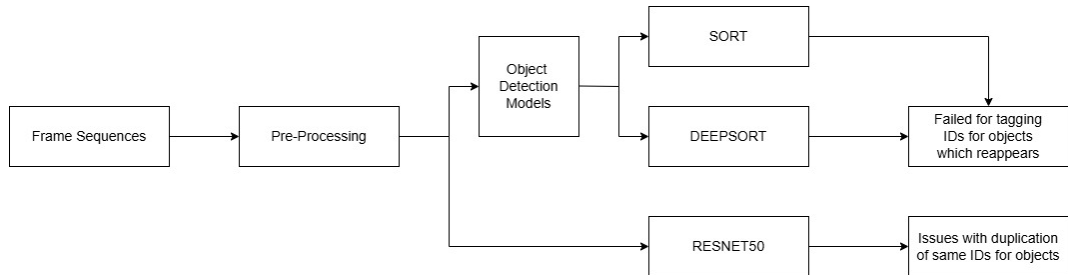
Figure 1: Object Tracking Flowchart

Metric	Full Form	SORT	ResNet	DeepSORT
MOTA	Multi-Object Tracking Accuracy	0.1068	**0.9010**	0.1326
MOTP	Multi-Object Tracking Precision	0.7942	**1.0000**	0.7799
IDF1	ID F1 Score (ID precision & recall)	0.1290	**0.9964**	0.4665
IDSw	Identity Switches	86	**4210**	346
MT	Mostly Tracked Targets	2	**361**	49
ML	Mostly Lost Targets	**336**	2	214
FP	False Positives	266	**0**	10958
FN	False Negatives	**40629**	32	28491
Recall	Detection Recall	0.0693	**0.9928**	0.3768
Precision	Detection Precision	0.9228	**1.0000**	0.6121
Frag	Track Fragmentations	–	–	36

Table 1: Comparison of Tracking Metrics across Models

- Future Scope:
    - Current pipeline needs improvement in consistently reassigning the original identity to objects that reappear after being lost.
    - Implementation of StrongDeepSORT as well as analysis of results between different algorithms.
- Discussions:
    - If the camera misses a detection (YOLO skips a frame), DeepSORT might drop a track.
    - If lighting or angle changes too much, ResNet might say "looks different" and assign a new ID.
    - If objects move too fast or close together, IoU tracking can fail even for SORT.

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