Progress Report: YOLOv8 Model Training on VisDrone Dataset

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I. PROGRESS SUMMARY

This week, we focused on refining the YOLOv8-based object detection and tracking pipeline. Our primary objective was to address challenges observed in the previous experiments, particularly in tracking performance and detection robustness.

A. Work Completed:

- Conducted additional training and fine-tuning of YOLOv8 on the VisDrone-MOT dataset.
- Performed hyperparameter optimization to balance between detection accuracy and tracking stability.
- Measured Multiple Object Tracking Accuracy (MOTA) and ID switching metrics to ascertain performance.
- Investigated the impact of varying environmental conditions (lighting, crowd density) on detection and tracking.
- Added additional post-processing techniques to remove false positives and ID switches.
- Explored computational efficiency improvements for real-time tracking.

B. Milestones achieved:

- Integrated advanced feature matching techniques for better object re-identification.
- Better tracking precision in environments with heavy occlusion through improved object association.
- Refined dataset preprocessing scripts for improved annotation consistency.

II. CHALLENGES & RESOLUTIONS

A. Problems faced:

- Tracking Instability: The system still struggles with tracking stability in very crowded and low-visibility scenes despite improvements.
- ID Switching: Even though downplayed, ID switches still occur fairly frequently in dynamic settings.
- False Detections: Changing confidence thresholds improved, but there are still some false positives.
- Computational Overhead: Real-time performance optimization continues to be a challenge, especially for edge deployments.

III. Upcoming Tasks

- Optimize computational efficiency for real-time application without loss of accuracy.
- Continue refining object association techniques to minimize ID switches.
- Implement other tracking algorithms more advanced than DeepSORT for comparison.
- Perform cross-validation on other datasets to assess generalizability.
- Complete documentation for open-source release, including model training pipeline and evaluation benchmarks.

IV. Conclusion

While significant progress was made in improving object tracking and detection, challenges remain in tracking stability and computational efficiency. The next steps will focus on enhancing real-time tracking performance and minimizing ID switches for better deployment readiness.