EAST WEST UNIVERSITY

Assignment Report-

Aerial _Vehicle_Detection.

Course Title: Machine Learning

Course code: CSE 475

Section: 03

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Submitted to:

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1. Dataset Overview: Aerial Vehicle OBB Dataset

Parameter	Detail
Domain	High-resolution aerial and drone-based imagery, primarily focusing on vehicle detection.
Splits	Total Labeled Images: 29,125 Training Set: 18,274 images Validation Set: 5,420 images Test Set: 5,431 images
Classes	Small vehicle Large vehicle
Annotation Format	`<class_id> <x_center> <y_center> <width> <height> <angle>` which means for every object, it stores the class number and the normalized center coordinates, width, height, and rotation angle of the bounding box in the image.

2. Model Setup Summary

1.Installed and imported essential libraries like ultralytics, cv2, and matplotlib for YOLOv10 setup.

2.Loaded and verified the aerial vehicle OBB dataset (train/val/test image counts).

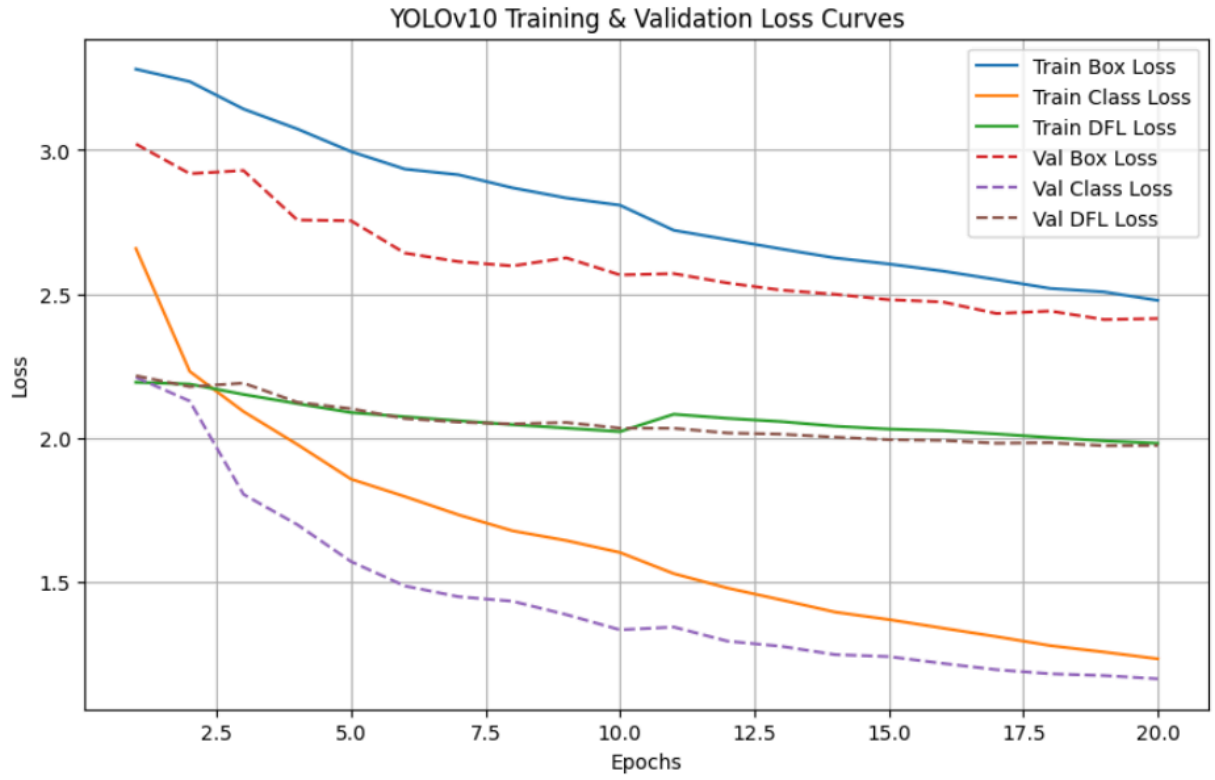
3.Configured dataset paths, trained YOLOv10 using the ultralytics.YOLO model, and evaluated results with visualization.

3. Evaluation results

Model	mAP@0.5	mAP@0.5:0.95	Precision	Recall	F1 Score
YOLOv10	0.84	0.56	0.84	0.77	0.80
YOLOv11	0.81	0.53	0.82	0.74	0.78
YOLOv12	0.81	0.53	0.83	0.74	0.78

4. Key observations

YOLOV10-Loss Curve



The loss curve shows excellent generalization confirming no overfitting. The Box Loss is the highest component, which highlights object localization as the main challenge during training. All loss components show a smooth, consistent decrease over the 20 epochs, indicating a well-tuned and stable learning process.