Dataset Information

In this project, a custom object detection model was developed to identify four types of fruits: **apple, orange, mango, and kiwi**. The dataset consisted of **160 images** collected from **Kaggle**, with an **80:20 split** between training and testing sets. All images were resized to **416×416 pixels**, and annotations were prepared in **YOLO format**, ensuring proper bounding box placement using tools like CVAT.

Model Choice & Why

For model training, **YOLOv8n** was chosen due to its **lightweight architecture**, **fast inference speed**, and compatibility with **low-resource environments** like CPU-based systems. It proved to be ideal for small datasets and quick experimentation. The training pipeline also incorporated **moderate data augmentations**, including horizontal flips, color jittering (hue, saturation, brightness), translation, and mosaic, which helped improve generalization and model robustness.

Challenges

Small dataset	Used **moderate augmentation** to boost generalization
Resource limits (CPU only)	Chose **YOLOv8n**, optimized for low compute
Cluttered backgrounds	Switched to **clearer images** & better annotations
Annotation mistakes	Verified manually using **custom CV2 visualization script**

Performance Metrics

The final model achieved a Box mAP@0.5 of approximately 0.68 and a mAP@0.5:0.95 around 0.54, indicating good detection capability across all classes. The best model weights were saved and used for visualization and deployment through a Streamlit-based UI demo, allowing real-time image uploads and prediction display.