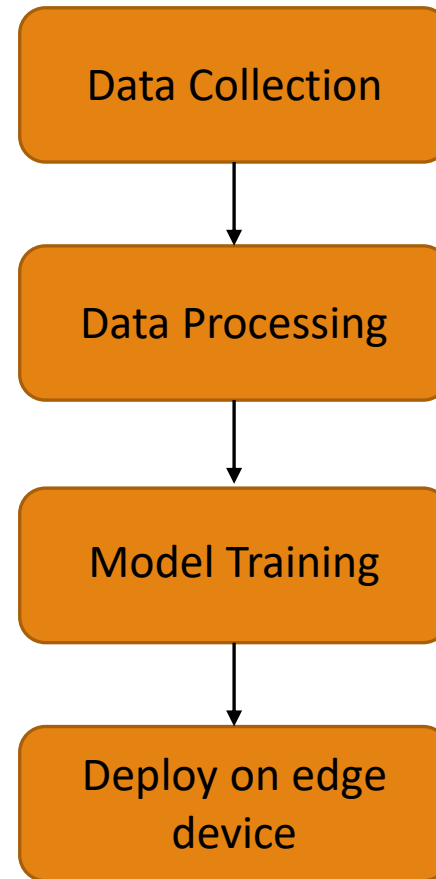


HELIPAD DETECTION

USING DEEP LEARNING

WORK FLOW



Data Collection

Collected Data: Drone Video Data of Helipad

- Heights: 5 meters and 10 meters
- Angles and Variations: Captured from various angles and perspectives

Helipad Dimensions:

- Shape: Square
- Marking: Red "H" inside a square box
- Dimensions: 165cm X 165cm

Additional Features:

- Switches: 9 switches created for enhanced functionality
- 1 Positive switches (+)
- 1 Negative switches (-)
- 7 Other switches for different purposes

Data Processing

Conversion:

Video frames transformed into individual images

Annotation: Images annotated for detection of 5 classes

- 100% Open
- 25% Closed
- 50% Closed
- Helipad
- Openswitch

Data Augmentation:

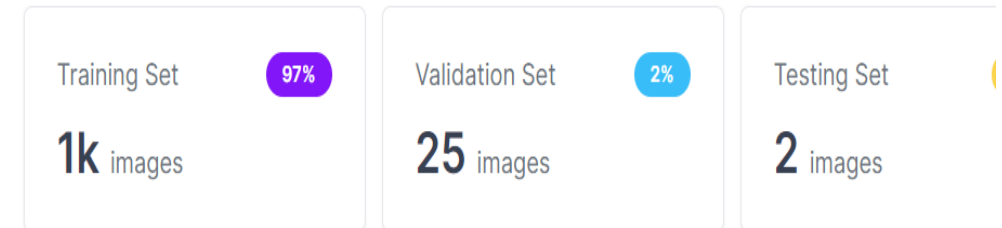
- Increased labelled data from 346 images to 1027 images

Purpose:

- Enhancing the diversity and quantity of the dataset.

Data Split:

TRAIN / TEST SPLIT



Model Training

YOLOv8 Model: Trained using an open-source application called Roboflow.

Dataset: Labelled dataset of annotated images

Training Process: Iterative training to optimize model performance

Model Evaluation:

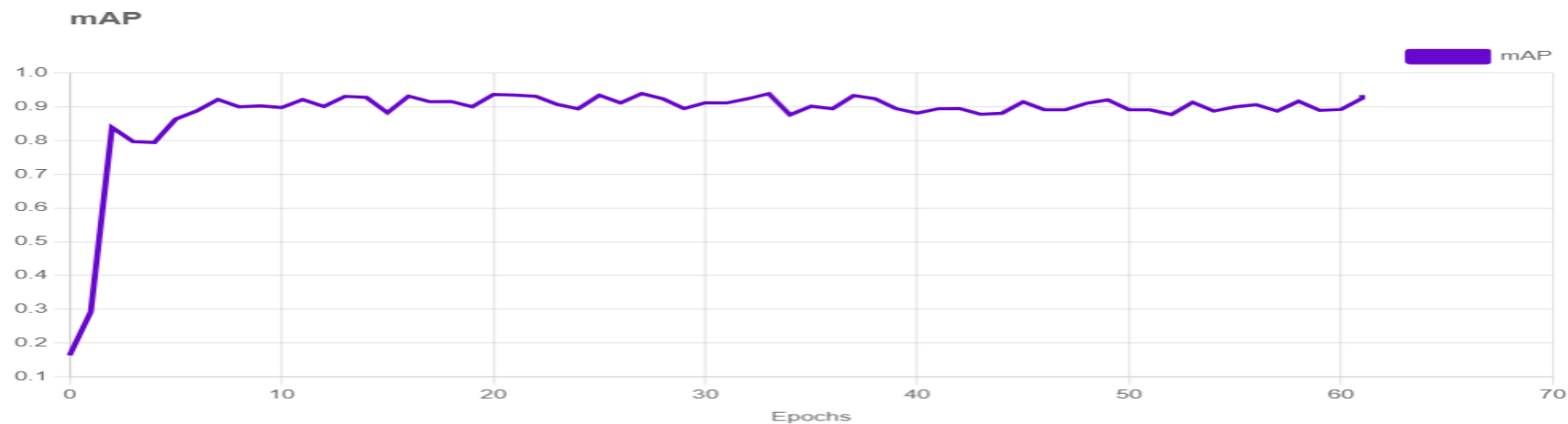
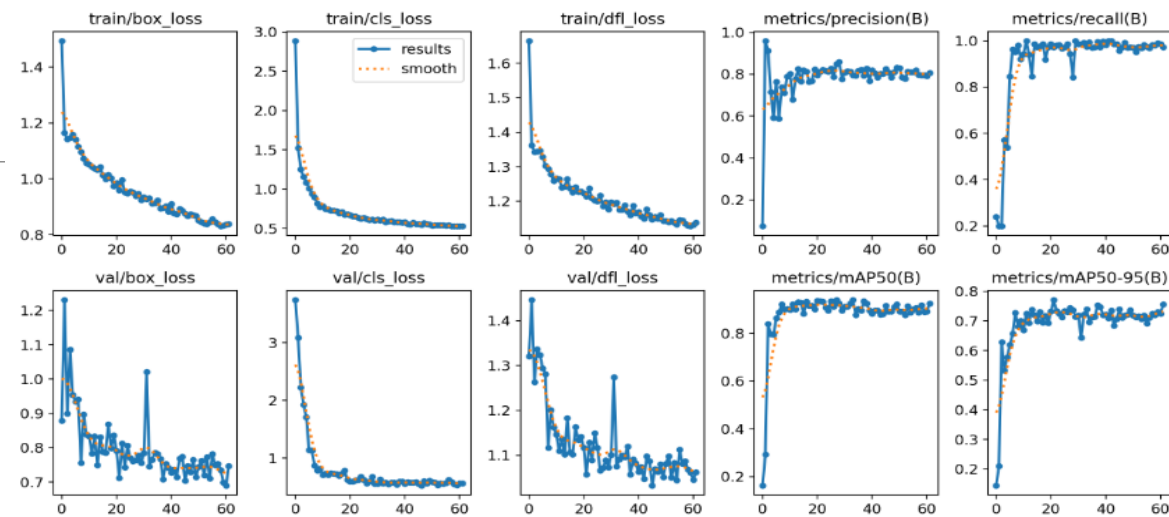
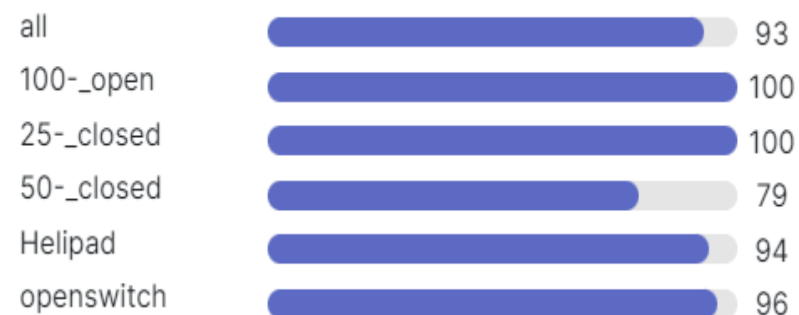
Performance Metrics: Achieved high mAP% (mean Average Precision)

Robustness Testing: Tested on various images and unseen 10-meter data videos

Results: Obtained accurate detections and predictions

https://drive.google.com/file/d/1tMcDP3kH31qnU1h7a3pIQLYkQB_GR_Ef/view?usp=sharing

Average Precision by Class



EfficientDet-D0

Model: EfficientDet-D0

Training Steps: Trained for 10,000 steps

Batch Size: 4

Training Platform: Google Colab

Average Results: Obtained lower mAP (mean Average Precision) compared to previous model

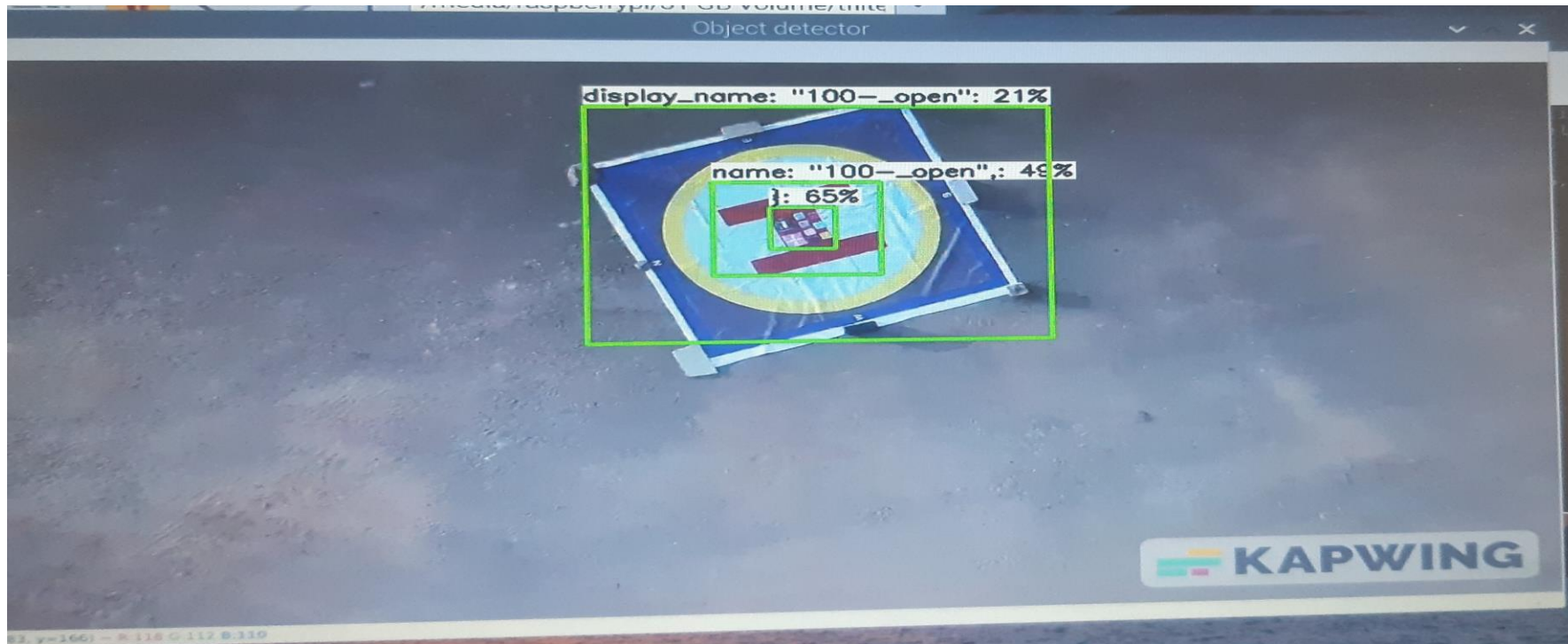
Identified Challenges: Factors contributing to lower performance

Model Conversion:

Conversion to TensorFlow Lite (TFLite): Transformed the model into a lightweight format

Purpose: Prepare the model for deployment on resource-constrained devices

Model Evaluation on Raspberry Pi

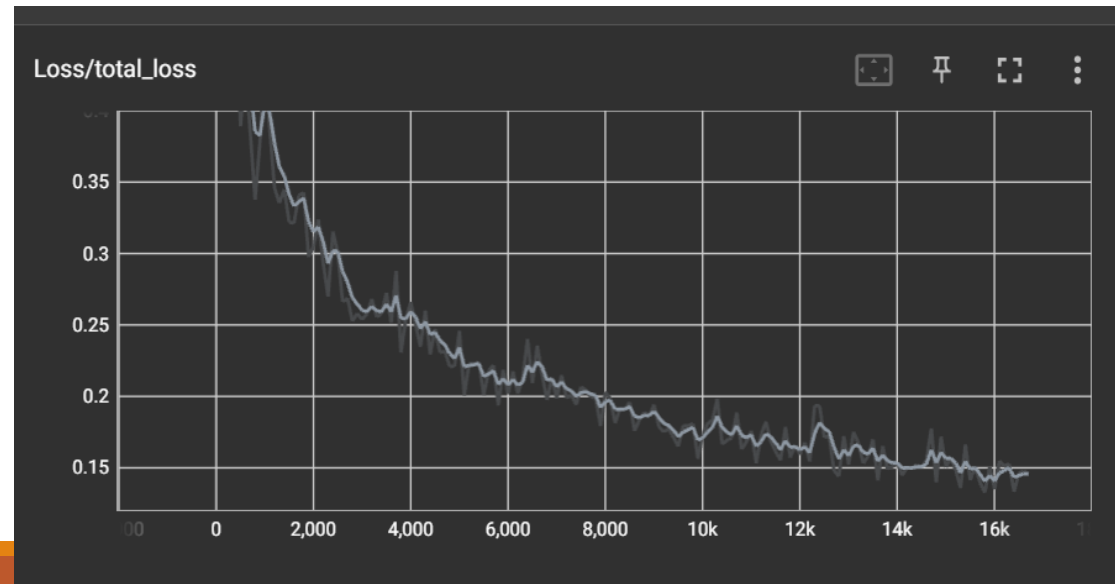
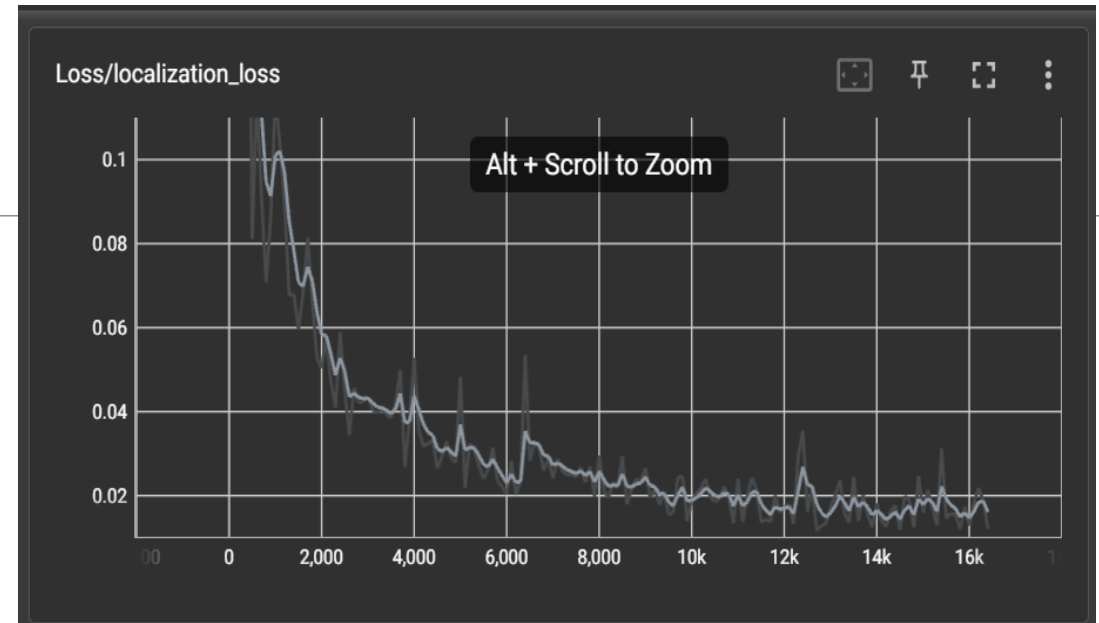
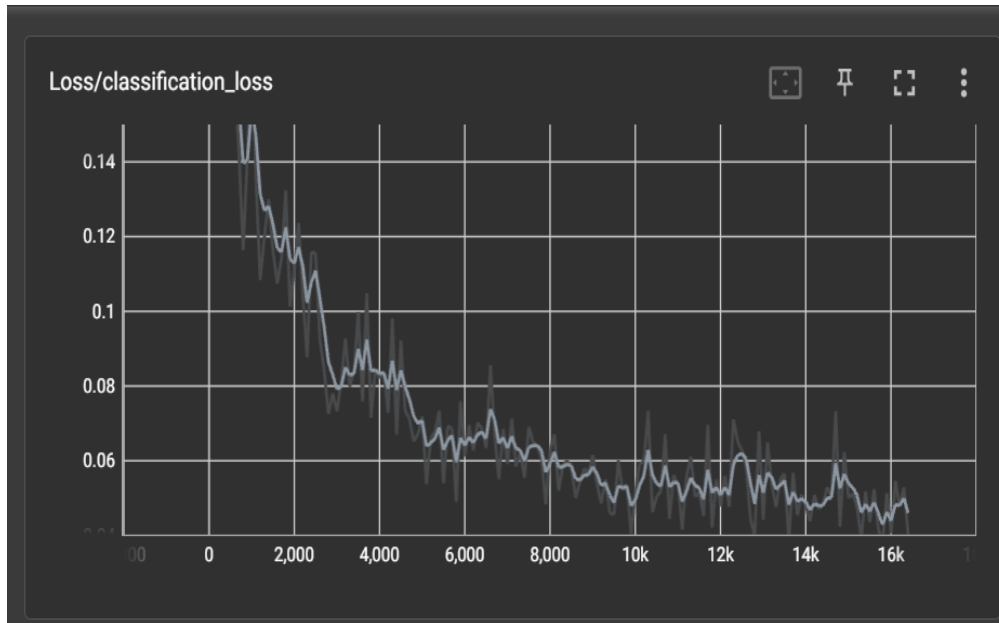


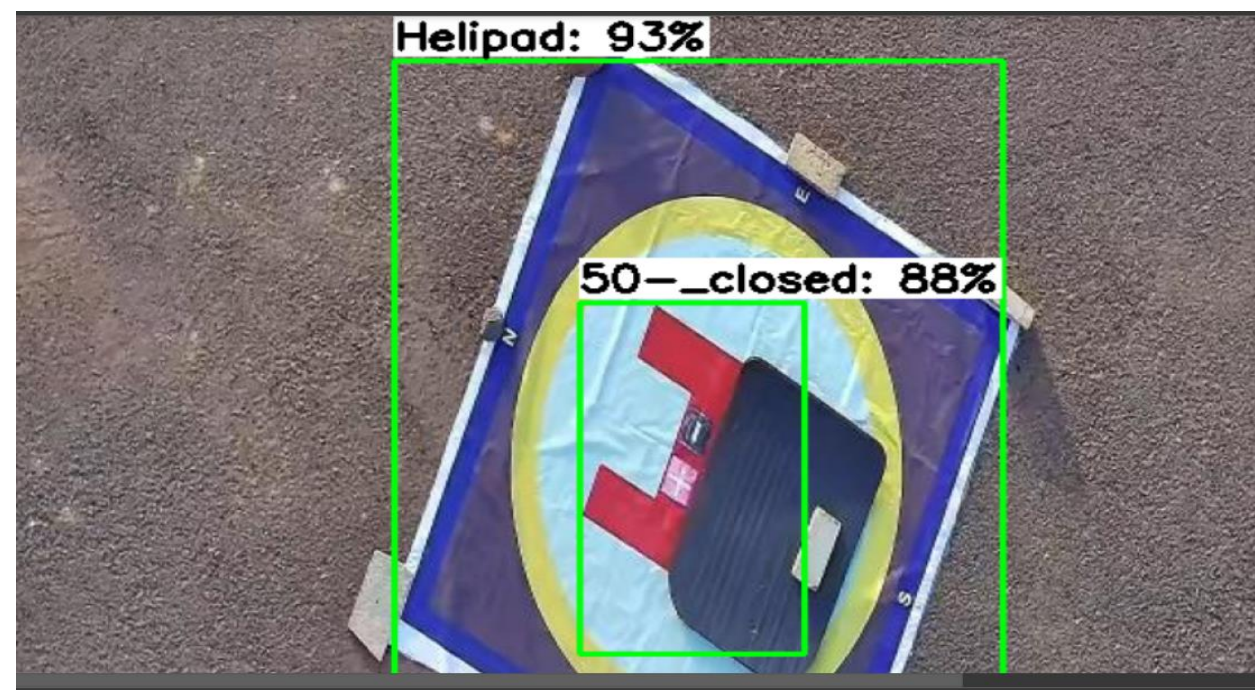
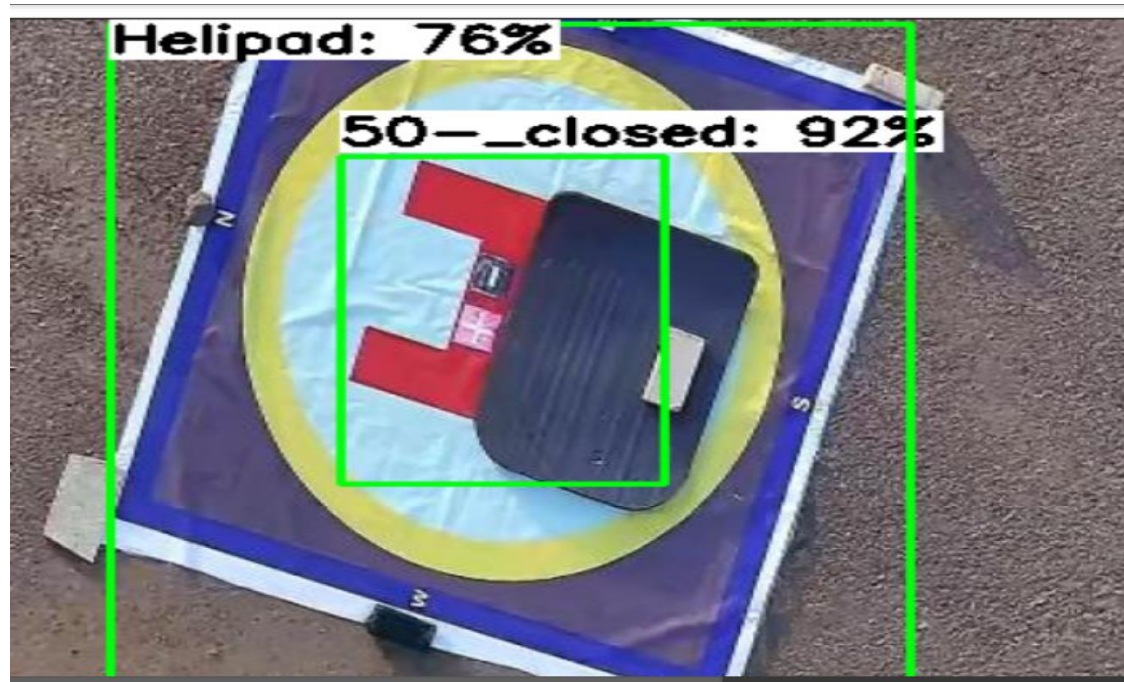
<https://drive.google.com/file/d/1Zshm2EtKIZCl0pU7TnEWJ-7m6wKb4D4I/view?usp=sharing>

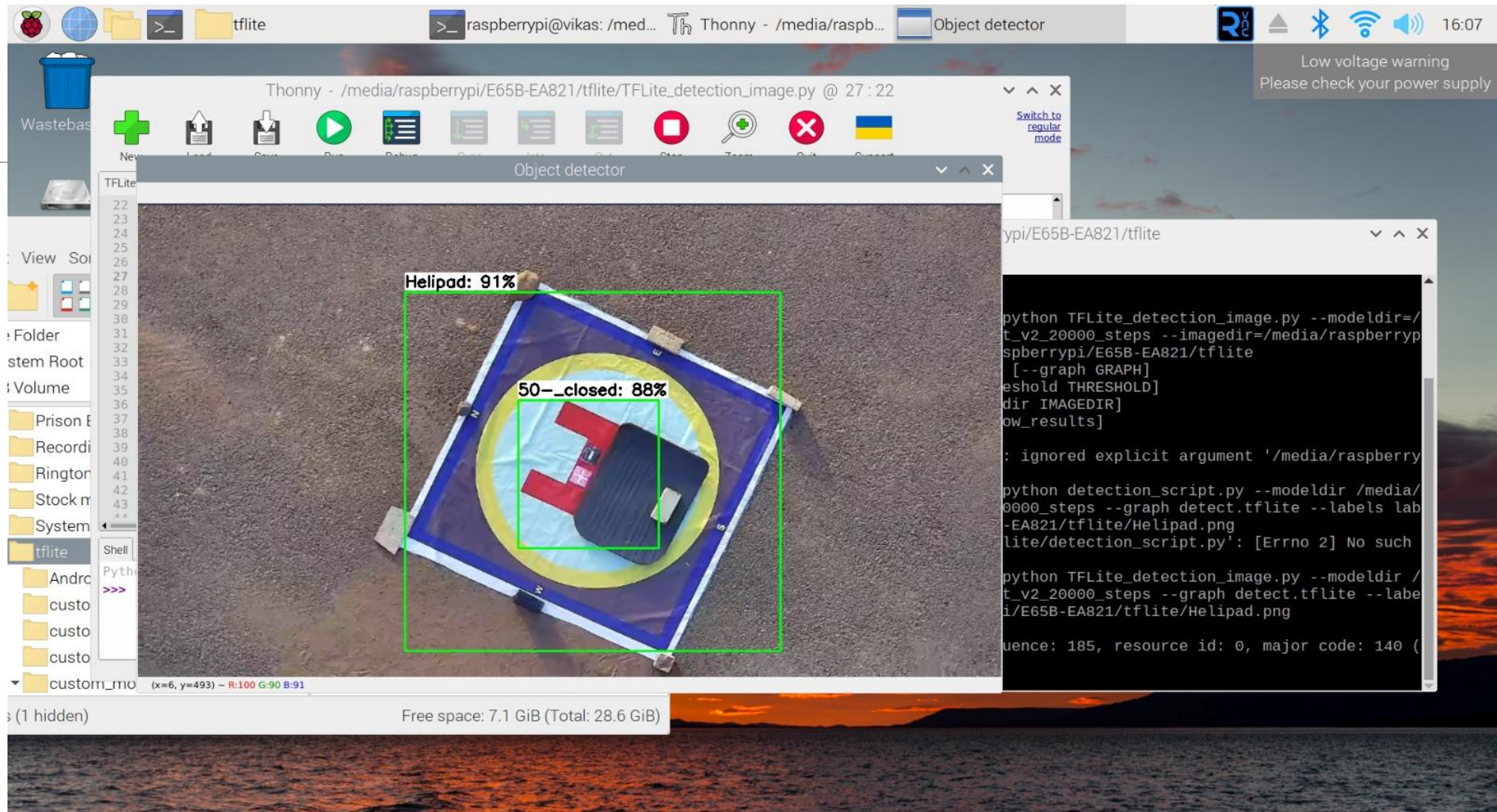
SSD-MobileNet-v2-FPNLite-320

- **Model:** SSD-MobileNet-v2-FPNLite-320
- **Training Steps:** 20,000 steps
- **Batch Size:** 16
- **Performance:** Achieved mAP (mean Average Precision) of more than 70%
- **Raspberry Pi Deployment :** Utilized Raspberry Pi for model deployment
- **Testing :** Evaluated the model on a video captured at a height of 10 meters
- **Assessing real-time performance on the Raspberry Pi**
- **Results:**
- **Successful Helipad Detection :** Demonstrated accurate detection of helipads in the 10-meter video on Raspberry pi.

Results

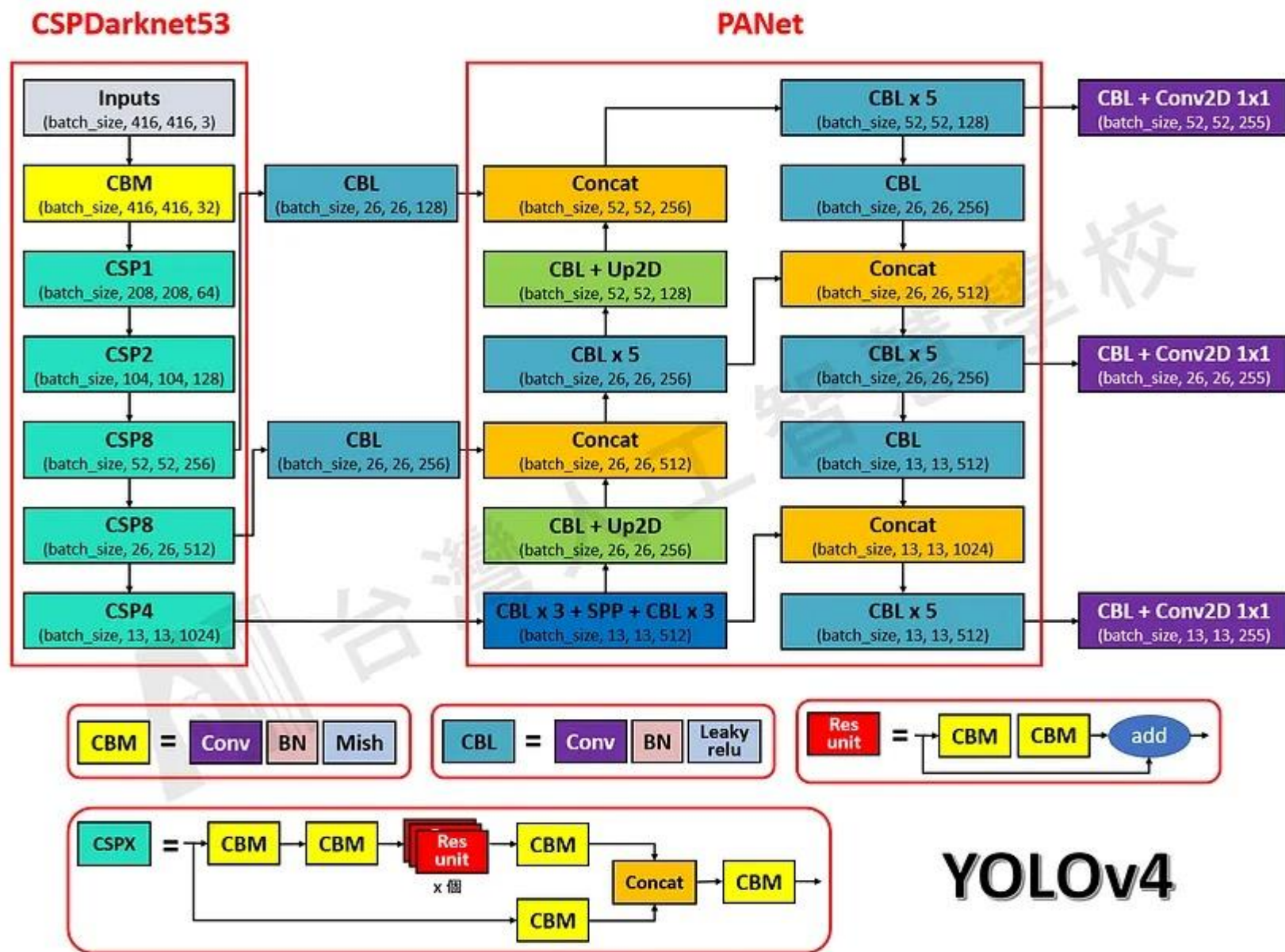






YOLOv4

Param $\approx 64,465,617$
Layers = 373



EfficientNet
 Param $\approx 4,049,571$
 Layers = 238

