

Aerial Bird vs Drone — Final Project Report

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1. Problem Statement

Classify aerial images as Bird or Drone to improve airspace safety and reduce false positives in detection systems

2. Dataset (provided by evaluators)

- classification_dataset: train/valid/test splits (bird, drone)
- object_detection_Dataset: YOLOv8 annotated images for detection tasks

3. Approach Summary

- Transfer learning using EfficientNetB0 backbone
- Data augmentation (rotation, flip, zoom, shift)
- Early stopping, model checkpointing, and learning-rate scheduling
- Grad-CAM for explainability
- Optional: YOLOv8 for object detection and localization

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4. Training & Evaluation (How-to)

- Prepare dataset under project root as described in README.
- Train classifier:
`python src/train_classifier.py --data classification_dataset --epochs 25 --batch 16`
- Evaluate:
`python src/evaluate.py`
- Replace models/final_model.h5 in models/ with trained model for the Streamlit UI.

5. Demo & Deliverables

- Streamlit app (streamlit_app/app.py) for live demo with Grad-CAM visualizations
- Demo video script included in demos/demo_video_script.md
- Confusion matrix and sample Grad-CAM images will appear in demos/ after evaluation.

6. Next steps & Improvements

- Fine-tune EfficientNet top layers
- Use class-balanced loss or focal loss if dataset imbalanced
- Train YOLOv8 for detection; merge detection output into UI
- Add CI/CD and Docker-based deployment on cloud