Wang, G., Chen, Y., An, P., Hong, H., Hu, J., & Huang, T. (2023). UAV-YOLOv8: A Small-Object-Detection Model Based on Improved YOLOv8 for UAV Aerial Photography Scenarios. Sensors, 23(16), 7190. https://doi.org/10.3390/s23167190

This paper is about the object detection part of UAV (unmanned aerial vehicle). Most existing detection models are of low accuracy because it is difficult to balance between detection performance and resource consumption. The main result of the paper is the optimization of YOLOv8 with the proposal of an object detection model based on UAV aerial photography scenarios (UAV-YOLOv8)

Problem with object detection task in UAV aerial photography scenarios:

- High proportion of small objects
- Complex backgrounds
- Limited hardware resources

Dataset

- VisDrone2019 dataset

Optimization

- Proposal of a UAV aerial scene object detection model called UAV-YOLOv8 based on YOLOv8
    - WIoU v3 loss function that incorporate a dynamic sample allocation strategy to reduce the model's attention to extreme samples and improve overall performance
    - BiFormer, an efficient attention mechanism, incorporated to the backbone network to enhance the model's focus on key image details while saving computation and memory
    - FFNB (feature processing module) which enhances feature fusion with fewer operations. Also two extra detection scales are added to improve recognition of very small objects without excessive computational cost.

Result

- The improved model achieves an average detection accuracy improvement of 7.7% over the baseline model without increasing its size or parameters
- The improved model outperforms some classical algorithms of similar types in terms of detection accuracy.
- With the two new detection layers, there was an increase in computation and inference time of the model. Nearly doubled, so there is still room for optimization of computational resource consumption
- But detection accuracy of the improved model is still not high for very small objects like bicycles