Title: Object Detection and Bounding Box Visualization using Faster R-CNN

Introduction:

This report outlines the improvements made to an initial code snippet for object detection and bounding box visualization. The initial code utilized a pre-trained Faster R-CNN model and required enhancements to improve the accuracy of bounding box predictions and reduce multiple overlapping bounding boxes.

Code Enhancements:

1. Confidence Thresholding:

The initial code did not have a confidence threshold for bounding box predictions. We introduced a confidence threshold (set to 0.5 by default) to filter out low-confidence detections. This significantly improved the accuracy of bounding boxes by removing less confident predictions.

2. Non-maximum Suppression (NMS):

The code was modified to incorporate non-maximum suppression (NMS) after confidence thresholding. NMS eliminates redundant bounding boxes with significant overlap, retaining only the highest-confidence bounding boxes for each object. The NMS threshold was set to 0.5 to control the overlap threshold.

3. Processing Multiple Images:

To accommodate multiple images in a dataset, we created a function process_dataset. This function takes a dataset directory and an output directory as input, finds all image files within the dataset directory, applies object detection and bounding box visualization to each image, and saves the processed images in the output directory.

4. Viewing Processed Images:
- To facilitate viewing the processed images, we provided options for both local image viewers and Matplotlib:
- Local Image Viewer: Images can be opened with the default image viewer on your local machine by navigating to the output directory.
- Matplotlib (Python): We added Python code that uses Matplotlib to display the processed images within your Python environment, allowing for programmatic inspection.

Conclusion:

The modifications made to the original code greatly improved the accuracy of bounding box predictions by introducing confidence thresholding and non-maximum suppression. Additionally, the code was extended to handle multiple images within a dataset, streamlining the object detection and bounding box visualization process.

(The provided report serves as documentation for the enhanced code, making it more effective and user-friendly for object detection tasks.)