

Assignment II - Object detection using Deep Learning

Applying and Fine-Tuning YOLO for Object Detection

In this assignment you will explore object detection using the YOLO (You Only Look Once) algorithm. You will not only apply the YOLO algorithm but also define a practical use case, collect training images, and evaluate the results, gaining a holistic understanding of object detection.

1. **Use Case Definition:** Select a real-world use case for object detection. This could be anything from pedestrian detection for autonomous vehicles to detecting specific objects in medical images. Clearly define the problem you intend to solve and explain why object detection is necessary for this use case.
2. **Data Collection:** Gather a dataset of images relevant to your use case. Ensure that the dataset includes annotated bounding boxes around the objects of interest. You may need to annotate the images yourself or find pre-annotated datasets.
3. **Data Preprocessing:** Preprocess the dataset by resizing images, normalizing pixel values, and splitting it into training, validation, and test sets. Ensure that the data is properly formatted for YOLO training.
4. **YOLO fine-tuning:** Leverage the YOLO algorithm using one of the solutions already implemented in GitHub. Fine-tune the YOLO model using the training dataset for optimal object detection performance.
5. **Model Evaluation:** Evaluate the trained YOLO model on the test dataset. Calculate object detection metrics such as mean average precision (mAP) and IoU (Intersection over Union) to assess its performance.
6. **Results and Discussion:** Present the results of your object detection task and discuss the practical implications of your use case. Reflect on the challenges and limitations encountered during the implementation and evaluation process.

Submission Guidelines:

- Submit your code, including data preprocessing, model implementation, training scripts, and evaluation scripts.
- Provide a detailed report documenting the entire process, including dataset description, model architecture, training strategies, evaluation metrics, and discussions. The report can be embedded in the Notebook comments and Markdown.
- Include any necessary visualizations, graphs, and figures to support your findings.