Object Detection Model for Marine Species

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Project Overview :

The goal of this project was to develop an object detection model using the MMDetection framework to identify various marine species in an aquarium setting. This involves training models on a dataset of marine life, evaluating their performance, and exploring enhancements through data augmentation.

Approach :

1) Dataset Preparation :

The dataset, sourced from Roboflow, was already in COCO format, making it directly compatible with MMDetection. It contains images of marine species such as fish, jellyfish, and starfish with corresponding bounding box annotations.

2) Model Selection :

We chose the rtmdet_tiny model from MMDetection's model zoo due to its balance between performance and computational resource requirements. The smaller model variant helps mitigate the memory errors and is suitable for our dataset size and complexity.

3) Configurations :

Three configuration files were prepared:

- **Without Augmentation:** rtmdet_tiny_aquarium.py, faster_rcnn_aquarium.py
- **With Augmentation:** rtmdet_tiny_aug_aquarium.py

Key modifications included:

- **Paths:** Updated to the local dataset directories.
- **Number of Classes:** Set to 8 to match the dataset.
- **Batch Size and Learning Rate:** Adjusted to balance training efficiency and hardware constraints.

4) Training Process :

Duration: Training each model took approximately 1.5 hours.
Challenges:

- **Resource Management:** Managed memory by selecting the required model.
- **Configuration:** Ensured compatibility of configurations with the model and augmentation strategies.

5) Recommendations for future works :

- Experiment with more advanced models or architectures (rtmdet_medium, rtmdet_large, faster_rcnn_r101) to see if they offer better performance without excessive computational demands.
- Refine the augmentation strategies to better simulate real-world variations and improve overall model robustness.
- Perform additional analyses to identify specific areas where the model struggles, such as particular configurations or object sizes, and target these areas for improvement.

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