Object Detection Model Building Assignment for AI Interns

Overview

In this assignment, you will build an object detection model by adding detection layers to an existing CNN backbone. This project will give you hands-on experience with computer vision architectures while allowing you to explore how to effectively use AI assistance in your development workflow.

Assignment Objectives

1. Select an appropriate CNN backbone architecture
2. Implement object detection layers on top of the chosen backbone
3. Train the model on an open-source dataset
4. Evaluate model performance
5. Document your experience and learnings

Implementation Guidelines

Step 1: Choose a CNN Backbone

Select any pre-trained CNN architecture as your backbone. Some options include(but are not limited to):

- ResNet (50, 101)
- VGG16
- MobileNet
- EfficientNet
- DenseNet

Step 2: Choose an Object Detection Approach

Implement one of the following detection frameworks:

- Single Shot Detector (SSD)
- Feature Pyramid Network (FPN)
- Region Proposal Network (RPN)
- YOLO-style detection head

Step 3: Select a Dataset

Choose any open-source object detection dataset, such as:

- COCO
- Pascal VOC
- Open Images
- KITTI
- Custom datasets from Roboflow or similar platforms

Step 4: Implementation

Build your model by:

1. Loading the pre-trained backbone
2. Freezing/unfreezing appropriate layers
3. Adding your detection head
4. Implementing loss functions
5. Setting up a training pipeline
6. Training and evaluating your model

Deliverables

1. Source code for your implementation
2. Trained model weights
3. Evaluation metrics (mAP, precision, recall)
4. Demo showing your model detecting objects on test images
5. Experience report (see below)

Experience Report Guidelines

Write a brief report about your experience completing this assignment. Your report should:

1. Be written by you personally (not AI-generated)
2. Include your genuine, raw thoughts about:
    - Challenges you faced during the implementation
    - How you used AI tools to help with coding
    - What you learned from the project
    - What surprised you about the process
    - How do you feel about the balance between writing code yourself vs. using AI assistance
    - Suggestions for improving this assignment

Be completely honest and authentic in your report. There are no "right" answers - we want to understand your genuine experience and perspective.

AI Usage Guidelines

Important: You are encouraged to use AI tools for code generation!

- Feel free to use ChatGPT, Claude, GitHub Copilot, or similar tools to assist with your coding
- Document which parts were AI-assisted and how you prompted/guided the AI
- Focus on understanding the code that AI generates for you
- Be prepared to explain how the generated code works
- Use AI tools to help debug issues you encounter
- You are free to use any online platforms like Colab/Kaggle for training requirements

Remember that while AI can help with implementation details, you should understand the overall architecture and approach. The goal is to learn how to effectively collaborate with AI tools while developing your understanding of computer vision models.

Evaluation Criteria

Your submission will be evaluated based on:

1. Correct implementation of object detection on your chosen backbone
2. Model performance on test data
3. Code quality and organisation
4. Thoughtfulness of your experience report
5. Effective use of AI assistance

Good luck with your assignment! Remember, the journey and learning process are just as important as the final results.