CSE 366: Artificial Intelligence - Computer Vision Assignment

Objective:

This assignment is designed to give you practical experience in developing and training deep learning models for computer vision tasks. You have the option to focus on either image classification or object detection, using specific datasets and model architectures.

Option 1: Image Classification

- **Dataset:** Use the dataset available at this link. This dataset comprises various images that you will classify into predefined categories.
  Link: https://data.mendeley.com/datasets/brfgw46wzb/1
- **Models to Implement:** You are required **to implement two of the following models**:
  - Custom CNN Model
  - EfficientNet
  - MobileNetV2
  - DenseNet 121
  - ResNet50

Train these models on the dataset and evaluate their performance using appropriate metrics. Provide a comparative analysis of the two models based on accuracy, training time, and complexity.

Option 2: Object Detection

- **Dataset:** Use the dataset available at this link. This dataset includes images for object detection tasks.

  Link: https://data.mendeley.com/datasets/8h3s6jkyff/1
- **Models to Implement:** Choose to implement one of the following models:
  - YOLOv8
  - YOLOv9

Focus on detecting objects within the images, quantifying the precision, recall, and mAP (mean Average Precision) of your model. Additionally, discuss the challenges faced during model implementation and tuning.

Requirements:

- **Code:** Implement your solutions using Python and appropriate deep learning libraries (e.g., TensorFlow, PyTorch) in a Google Colab notebook.
- **Colab Notebook:** Submit a detailed Colab notebook containing:
  - Introduction to the problem statement and your approach.

    - Data preprocessing steps.
    - Model architecture and rationale for choosing specific models.
    - Training process, including any hyperparameter tuning.
    - Evaluation metrics and results with visualizations.
    - Discussion of the results and any observed trends or anomalies.
    - Conclusion and possible future work.
- **Presentation:** Prepare a brief presentation summarizing your findings and methodologies.

Submission Details:

- **Format:** Submit your Colab notebook in your github account.