ML Engineering Assignment

Project: Screen Defect Detection on Mobile Phones

Objective

Develop a machine learning model that can accurately detect and classify screen defects visible on the front side of mobile phones.

Provided Data

You will receive or collect labeled images for the following screen condition classes:

- Major Scratch
- Minor Scratch
- None

You may also download additional images from public sources to expand the dataset if needed.

Requirements

1. Data Preparation

- Preprocess images (e.g., resizing, normalization).
- Perform data augmentation (e.g., rotations, brightness adjustments, noise addition).
- Ensure balanced class representation for all 3 categories.

2. Model Development

- Implement any architecture of your choice (e.g., custom CNN, ResNet, MobileNet).
- Clearly explain your design and architecture decisions.
- Ensure the model can distinguish subtle visual differences between defect severity levels.

3. Evaluation

- Accuracy
- Precision and Recall per class
- Confusion Matrix

- Describe any techniques used to handle class imbalance (e.g., oversampling, weighted loss)

4. Inference

- Create an inference script or notebook that:
  - Loads a single image
  - Runs prediction
  - Outputs the predicted label and confidence score

5. Code Quality

- Write clean, modular, and well-documented code
- Include a requirements.txt or environment.yml file listing all dependencies

Expected Output Labels

The model must predict exactly one of the following labels for each input image:

- Major Scratch
- Minor Scratch
- None

Deliverables

- A Python project (Jupyter Notebook or script) implementing the full workflow
- A trained model capable of running inference on new images
- Documentation explaining your approach, model choice, and evaluation results