EfficientNet-B3 Model Documentation

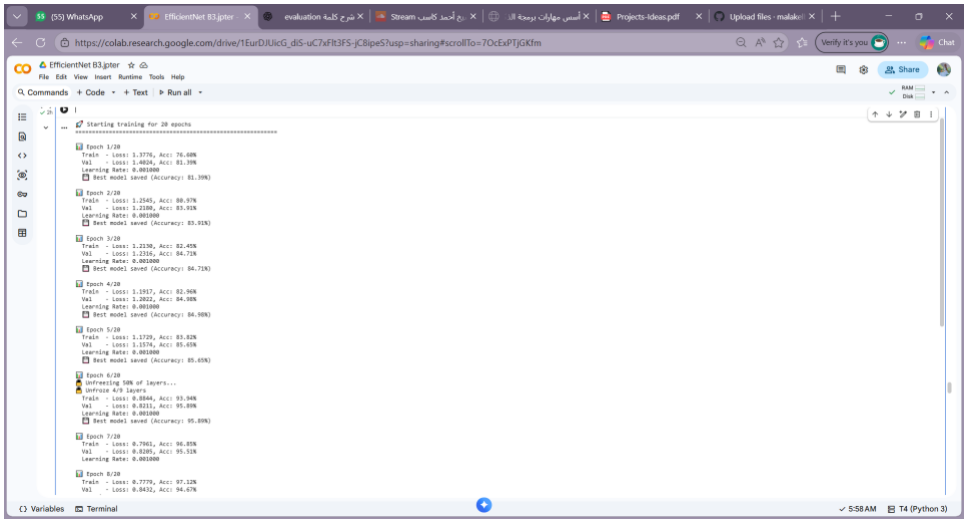
This document presents a detailed documentation of the image classification model based on EfficientNet-B3. The focus is on the model architecture, training strategy, evaluation results, and interpretation, without discussing data preprocessing steps.

1. Model Overview

EfficientNet-B3 is a convolutional neural network architecture that scales depth, width, and input resolution in a balanced manner using compound scaling. It achieves high accuracy with fewer parameters compared to traditional CNN architectures.

2. Training Process

The model was trained for multiple epochs using transfer learning. Initially, the base layers were frozen, and later fine-tuning was applied by unfreezing part of the network. The best model was selected based on validation accuracy.

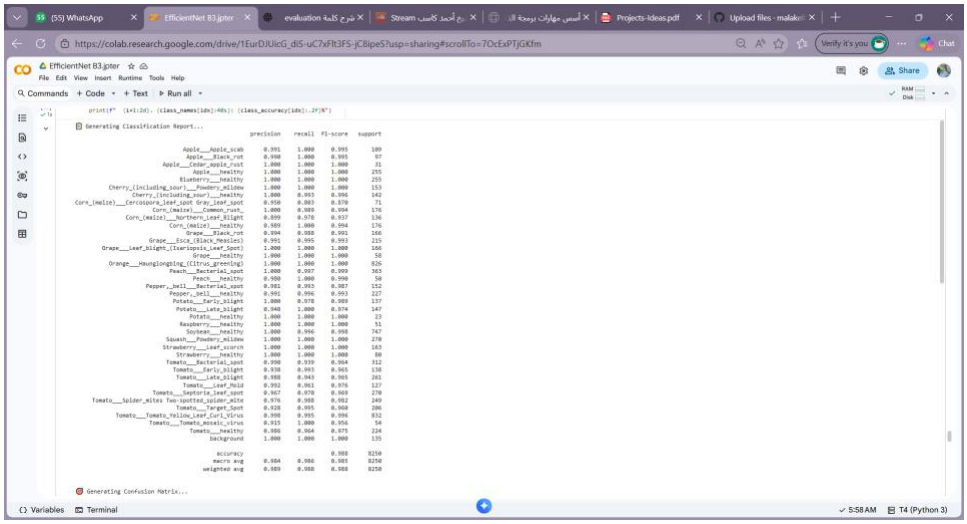


3. Training and Validation Curves

The following plots illustrate the training and validation loss, accuracy, and learning rate schedule across epochs.

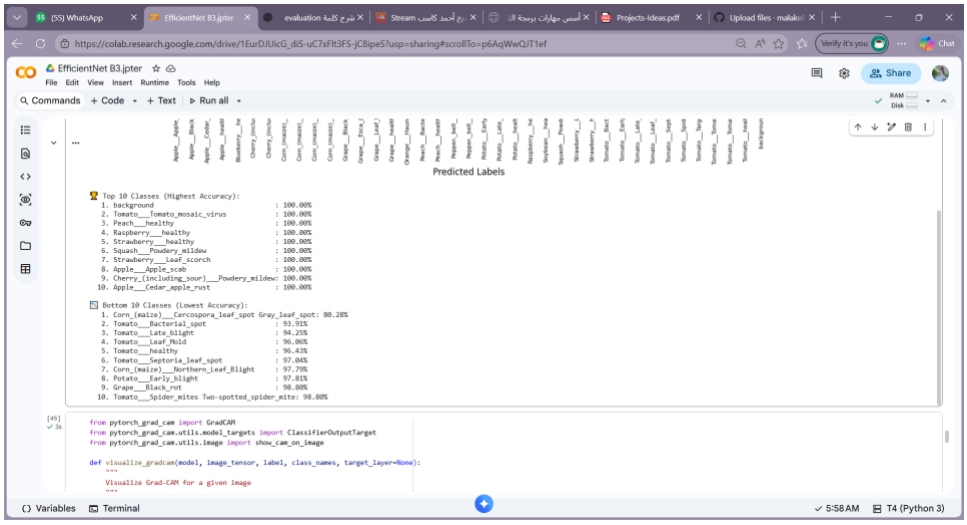
4. Evaluation Results

The trained model was evaluated on a held-out test dataset. The results show high generalization performance, achieving strong accuracy and low loss values.



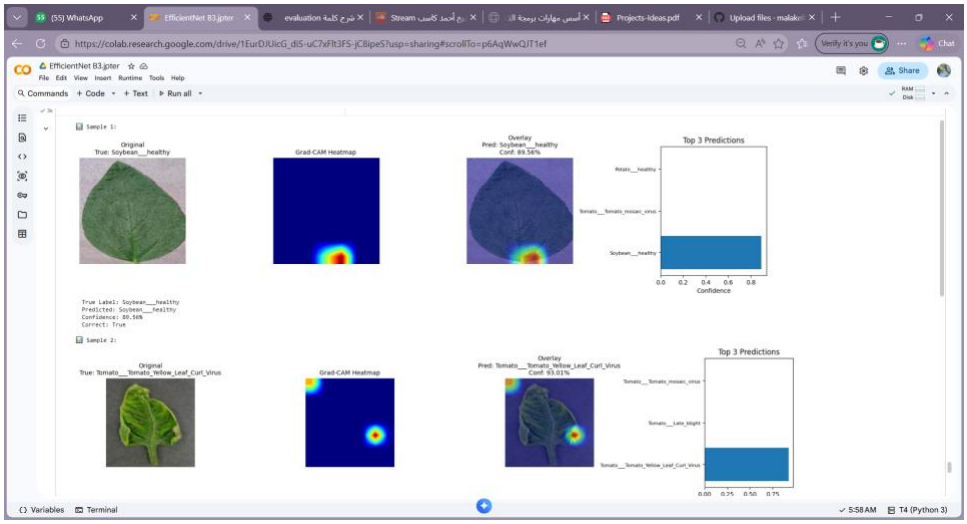
5. Classification Report

A detailed classification report was generated, including precision, recall, F1-score, and support for each class. Most classes achieved very high performance, indicating robust feature learning.



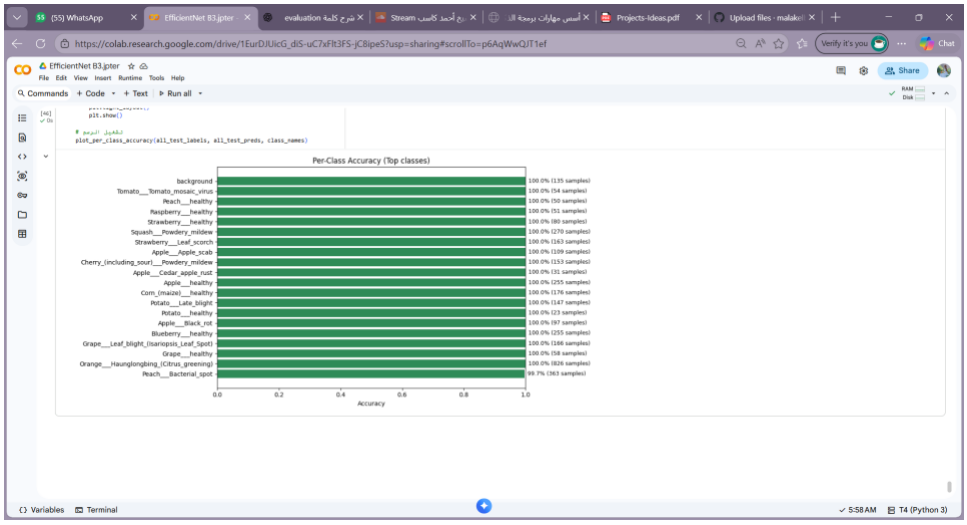
6. Per-Class Performance

Per-class accuracy analysis highlights the strongest and weakest classes. This helps identify which categories the model handles best and where further improvements could be applied.



7. Model Interpretation (Grad-CAM)

Grad-CAM visualizations were used to interpret model predictions. They highlight the regions of the image that contributed most to the predicted class, enhancing explainability and trust in the model.



8. Conclusion

The EfficientNet-B3 model demonstrates excellent performance in image classification tasks. Through transfer learning, fine-tuning, and thorough evaluation, the model achieves high accuracy and reliable predictions, making it suitable for academic and practical applications.