EAST WEST UNIVERSITY

Department of Computer Science and Engineering

Project Task - 2

Course Code: CSE 475
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Group: 06

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Selected Model: EfficientNet-B0

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Task 2: Model Implementation Report

In this task, the focus was on implementing and evaluating deep learning models for Betel Leaf disease classification. The dataset used was the Betel Leaf Dataset consisting of images of Healthy, Diseased, and Dried leaves captured under both controlled and on-field conditions.

Objective

The objective of Task 2 was to implement multiple model backbones and analyze their performance across different train-test splits. For this experiment, the EfficientNet-B0 architecture was used to evaluate the performance under various split ratios ranging from 10:90 to 90:10.

Methodology

The EfficientNet-B0 model was implemented using PyTorch. It was trained on the processed Betel Leaf dataset for multiple train-test split ratios: 10:90, 20:80, 30:70, 40:60, 50:50, 60:40, 70:30, 80:20, and 90:10. Each split was trained separately for 30 epochs using a learning rate of 0.001, batch size of 32, and weight decay regularization.

During training, each model was evaluated using accuracy, precision, recall, F1-score, ROC-AUC, and computational metrics such as GFLOPs, parameters (in millions), training time, and testing time. These metrics help analyze the performance and efficiency of the EfficientNet-B0 model.

Model: EfficientNet-B0

EfficientNet-B0 is a compound-scaled convolutional neural network that balances depth, width, and resolution. This architecture achieves high accuracy with fewer parameters compared to conventional networks like ResNet or VGG. In this experiment, EfficientNet-B0 was fine-tuned on the Betel Leaf dataset to learn key visual differences between healthy, diseased, and dried leaves.

Results and Discussion

Split	*Accuracy*	*Precision*	*Recall*	*F1*	*ROC_AUC*	*GFLOPs*	*Params_M*	*TrainTime_sec*	*TestTime_sec*
10:90	99.26	0.9925	0.9927	0.9926	NaN	0.414	4.01	1521.6	464.22
20:80	99.93	0.9993	0.9993	0.9993				2928.06	418.65
30:70	99.84	0.9984	0.9984	0.9984				4518.65	373.76
40:60	99.81	0.9982	0.9981	0.9981				5741.18	334.66
50:50	100	1	1	1				7203.44	264.25
60:40	99.72	0.9972	0.9973	0.9972				8710.04	211.23
70:30	99.81	0.9982	0.9981	0.9981				10115.62	157.2
80:20	99.72	0.9974	0.9971	0.9972				10199.52	91.67
90:10	100	1	1	1				12827.4	57.04

From the above table, it can be observed that EfficientNet-B0 consistently achieved high accuracy across all splits, ranging between 99.26% and 100%. Precision, recall, and F1-scores were also nearly perfect in all cases, indicating a well-generalized model.

The training time increased proportionally with the size of the training dataset, peaking at 12827.4 seconds for the 90:10 split. Testing time decreased as the training set size increased, showing that the model became more efficient after being exposed to more training data.

Overall, the EfficientNet-B0 model performed excellently for Betel Leaf disease classification, demonstrating high accuracy and computational efficiency.

Conclusion

In Task 2, I implemented and evaluated the EfficientNet-B0 model for Betel Leaf disease classification across multiple train-test splits. The model achieved exceptional accuracy and near-perfect precision, recall, and F1 scores for all splits. This confirms that EfficientNet-B0 is a highly effective and efficient architecture for agricultural image classification tasks.