PLANTS CLASSIFICATION

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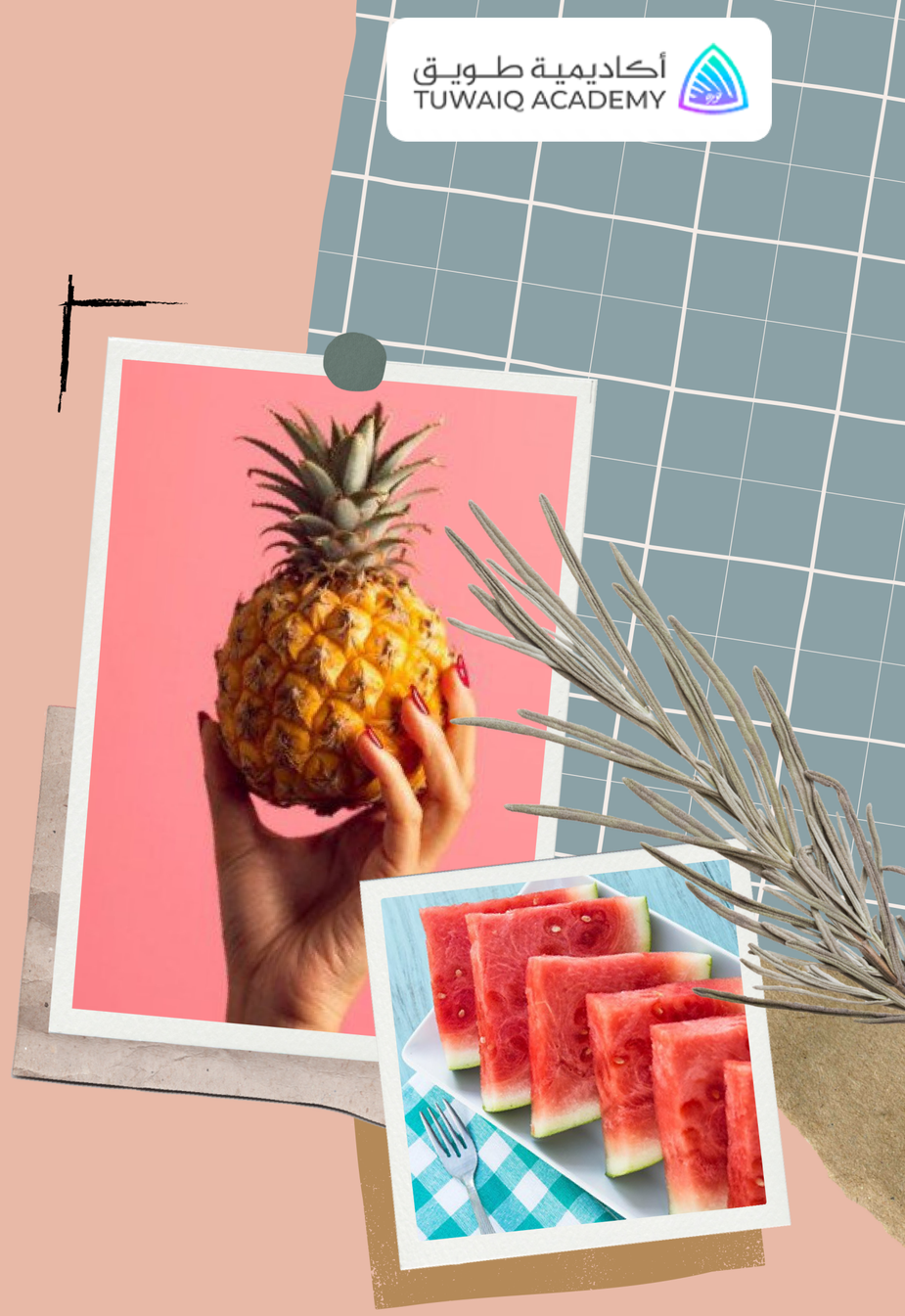

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About Dataset

THE DATASET CONTAINS **30** TYPES OF PLANTS IMAGES, INCLUDING **21000** TRAINING IMAGES, **3000** VALIDATION IMAGES AND **6000** TEST IMAGES, WITH A TOTAL DATA SIZE OF **1.48GB**

AND SUPPORTS THE **RECOGNITION** OF THE FOLLOWING PLANTS TYPES:

MELON
PINEAPPLE
SPINACH
TOBACCO

PREPROCESS AND DATA AUGMENTATION

TRAINING DATA AUGMENTATION:

- **RESCALING:** NORMALIZING PIXEL VALUES TO THE **RANGE [0, 1]**.
- **ROTATION RANGE**: RANDOMLY ROTATING IMAGES UP TO **20 DEGREES.**
- **HORIZONTAL FLIP:** RANDOMLY FLIPPING IMAGES HORIZONTALLY.
- **VERTICAL FLIP:** RANDOMLY FLIPPING IMAGES VERTICALLY.

VALIDATION DATA PREPROCESSING:

- ONLY RESCALING WAS APPLIED, MAINTAINING CONSISTENCY WITH THE TRAINING DATA.

TEST DATA PREPROCESSING:

- SIMILAR TO VALIDATION DATA, RESCALING WAS THE ONLY PREPROCESSING STEP.

DATA GENERATORS AND BATCH PROCESSING

- **BATCH SIZE**: SET TO 32
- **TARGET SIZE**: IMAGES WERE RESIZED TO A UNIFORM SIZE OF 224X224 PIXELS
- **CLASS MODE**: CATEGORICAL, INDICATING THAT THE LABELS ARE ONE-HOT ENCODED FOR MULTI-CLASS CLASSIFICATION TASKS.
- **SHUFFLE (FOR TRAINING)**: RANDOMLY SHUFFLING THE TRAINING DATA TO PREVENT THE MODEL FROM LEARNING SEQUENTIAL PATTERNS.

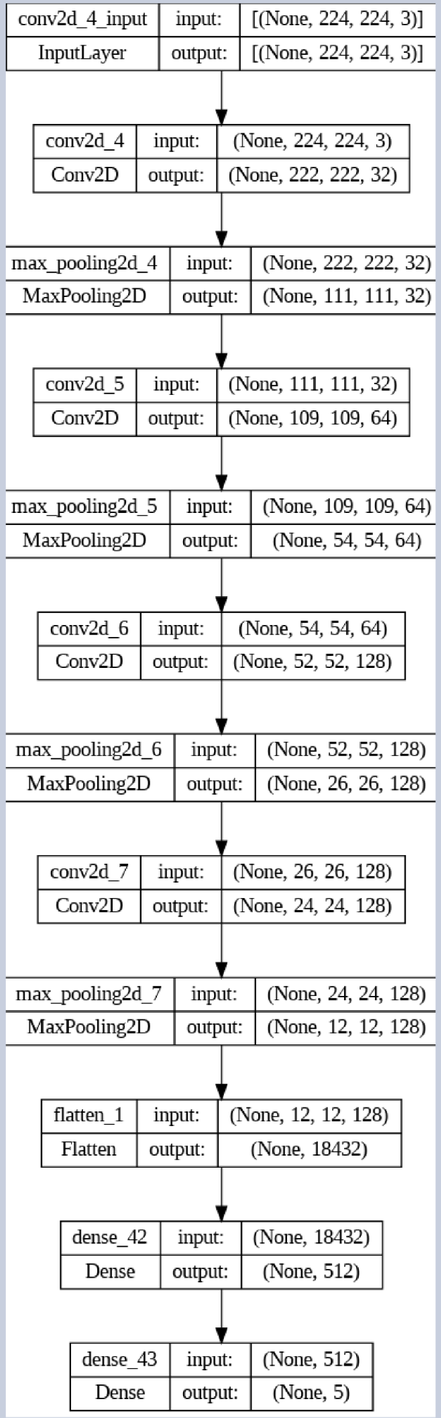
TRANSFER LEARNING WITH PRE-TRAINED MODEL (VGG16)

- **Model Initialization**: We instantiated the VGG16 model with pre-trained weights from ImageNet and excluded the top classification layers to customize it for our specific task.

- **Transfer Learning Layers**: We appended our custom classification layers on top of the VGG16 base model.

- **Model Compilation and Training:** We compiled the model with the Adam optimizer and categorical cross-entropy loss function. During training, we utilized the ModelCheckpoint callback to save the best model weights based on validation accuracy.

- **Model Evaluation:** Finally, we evaluated the model's performance on the validation set, yielding an accuracy of 87%.



TRAINING A MODEL FROM SCRATCH

MODEL COMPARISON AND EVALUATION

Transferred Model Validation Accuracy: The transferred model achieved a validation accuracy of **0.87**

Model Trained from Scratch Validation Accuracy: In contrast, the model trained from scratch exhibited a lower validation accuracy of **0.605**

FINE-TUNING HYPERPARAMETERS OF THE TRANSFERRED MODEL

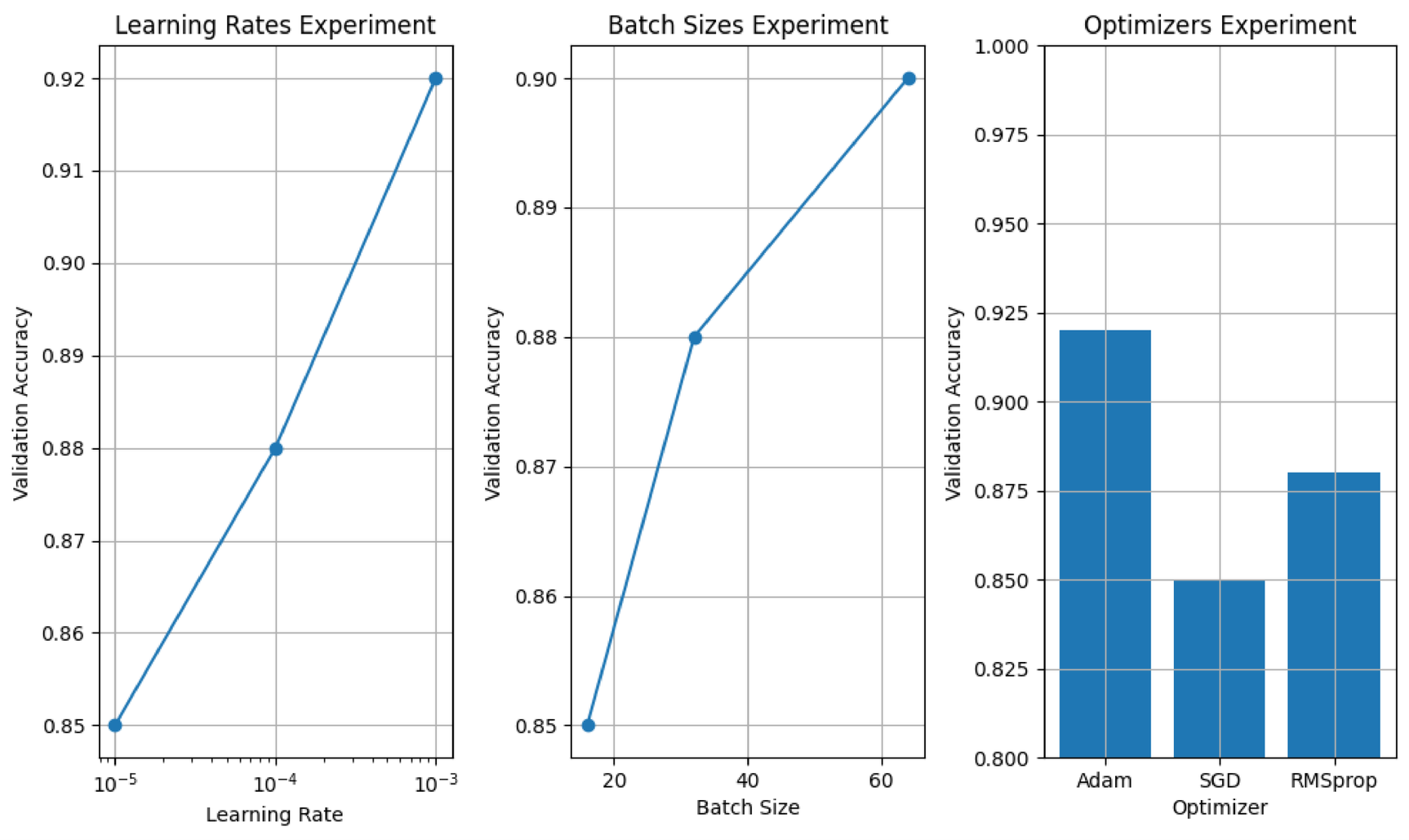
Fine-tuning with Unfrozen Base Model Layers

After training for an additional 5 epochs, the fine-tuned model achieved a validation accuracy of **0.925**

Experimenting with Different Hyperparameters:

- **Learning Rates Experiment**: [0.001, 0.0001, 0.00001]
- **Batch Sizes Experiment**: [16, 32, 64]
- **Optimizers Experiment**: [Adam, SGD, RMSprop]

the fine-tuned model achieved a validation accuracy of


Learning Rates Experiment
Validation Accuracy
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
10^{-5}
10^{-4}
10^{-3}
Learning Rate
Batch Sizes Experiment
Validation Accuracy
0.90
0.89
0.88
0.87
0.86
0.85
20
40
60
Batch Size
Optimizers Experiment
Validation Accuracy
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825
0.800
Adam
SGD
RMSprop
Optimizer

Thank You