

REPORT

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INTRODUCTION

- Beneficial in the environmental industry
- Flowers look visually similar (rose vs peonies)
- Manual classification is difficult & time-consuming
- Identify flowers based on pattern, colours and textures





DATA EXPLORATION & PRE-PROCESSING

Data Exploration



1. Find the numbers of classes in the dataset
2. Verifying valid image files
 - Images in correct format (JPG, PNG, JPEG)
3. Checking class balance
4. Visualization
 - (before & after data augmentation)

Pre-processing step

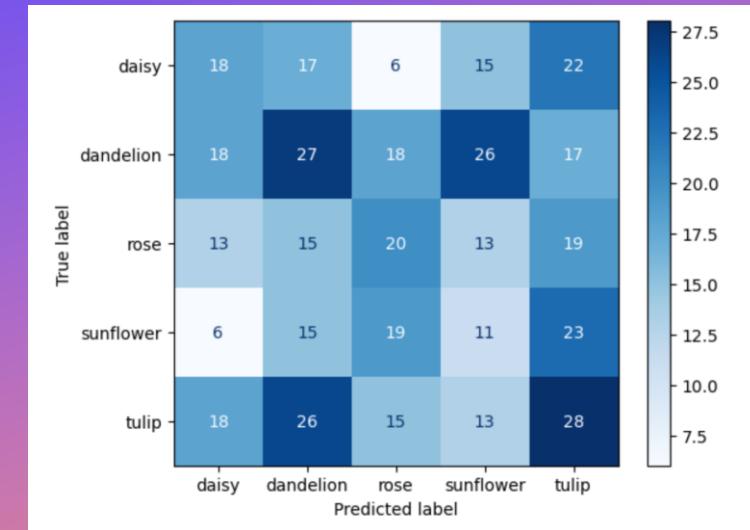
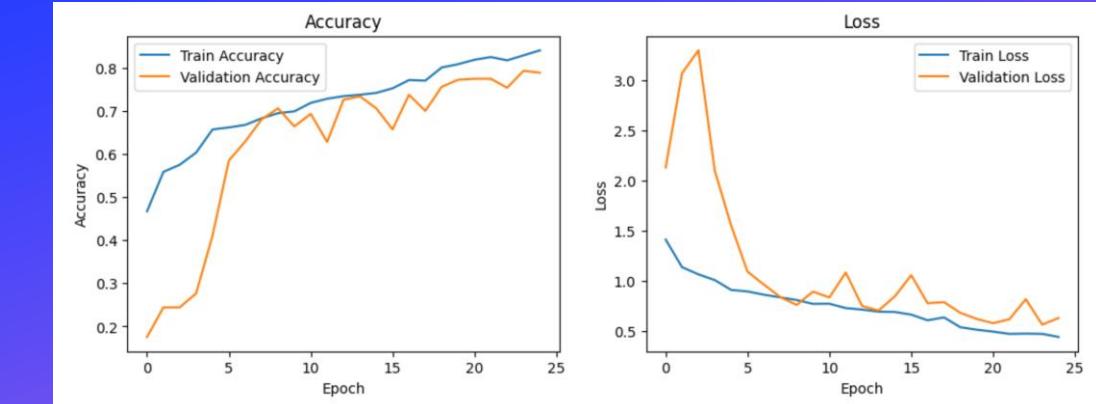
1. Splitting the dataset
 - 0.6 : 0.2 : 0.2
2. Data augmentation
 - Rescaling
 - Shifting (width & height)
 - Rotating images
 - Zooming
 - Horizontally flipping images
3. Data generators
 - Apply to only training data



BASELINE MODEL

Plans for Improvement

1. Implement transfer learning
 - Utilize pretrained models to enhance feature extraction
2. Hyperparameter Tuning
 - Optimize learning rate, dropout, batch size, weight initialization to improve model performance
3. Fix Confusion Matrix issues & Misclassifications
 - Address class imbalance
4. Structured Transfer Learning & Evaluation Process



	precision	recall	f1-score	support
daisy	0.15	0.14	0.15	78
dandelion	0.26	0.25	0.25	106
rose	0.23	0.23	0.23	80
sunflower	0.18	0.19	0.18	74
tulip	0.20	0.22	0.21	100
accuracy			0.21	438
macro avg	0.20	0.20	0.20	438
weighted avg	0.21	0.21	0.21	438

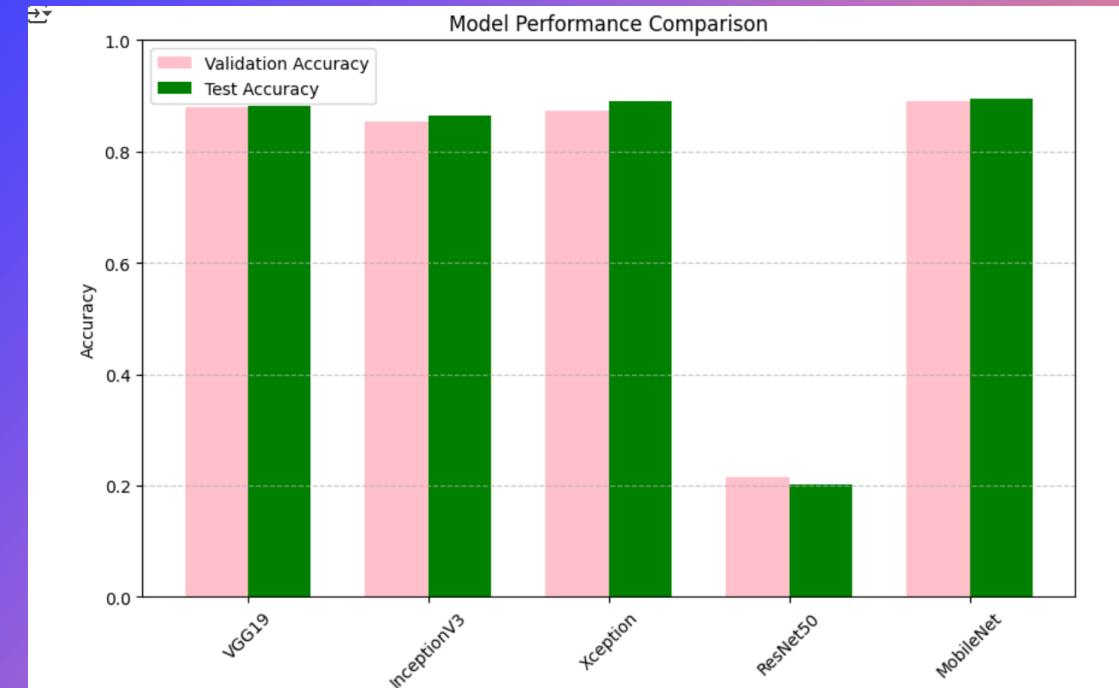
ADDITIONAL MODELS

Explore pretrained models

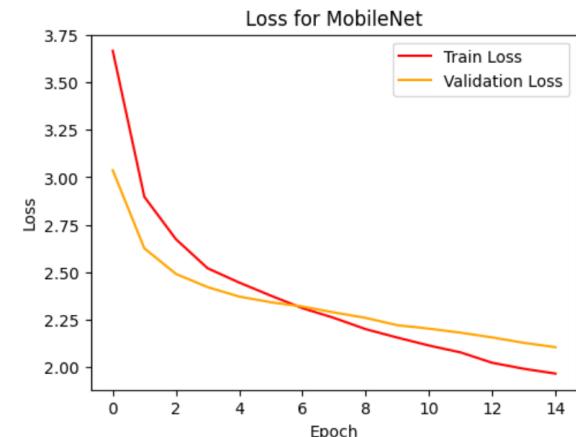
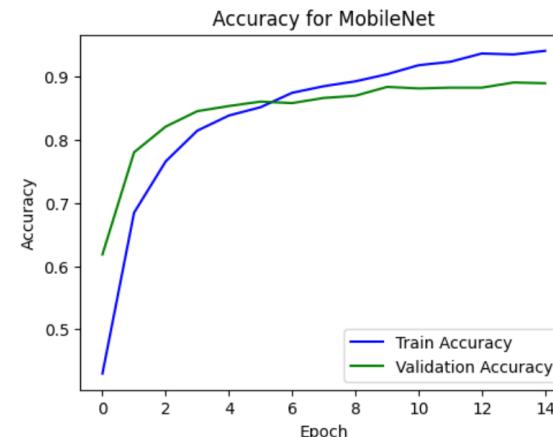
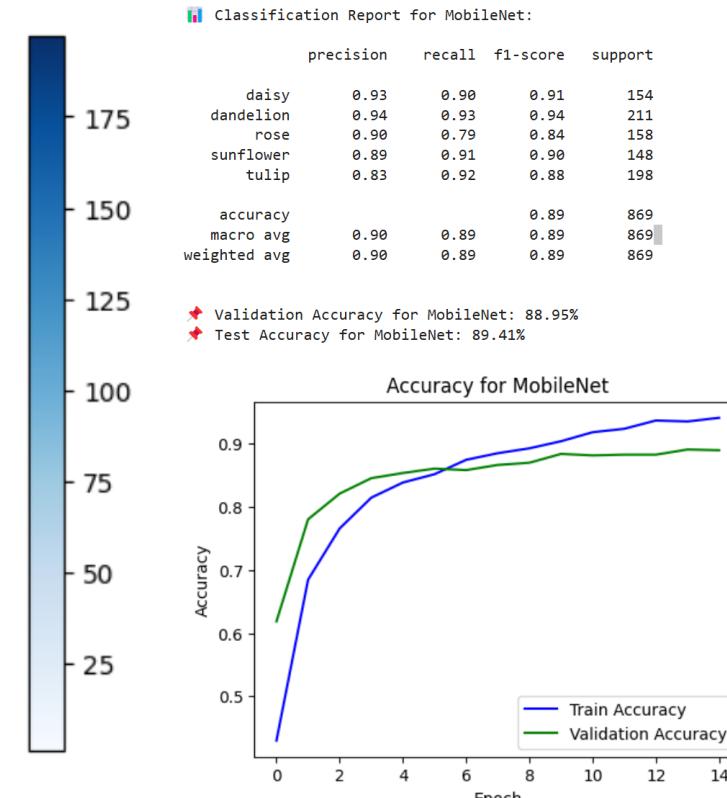
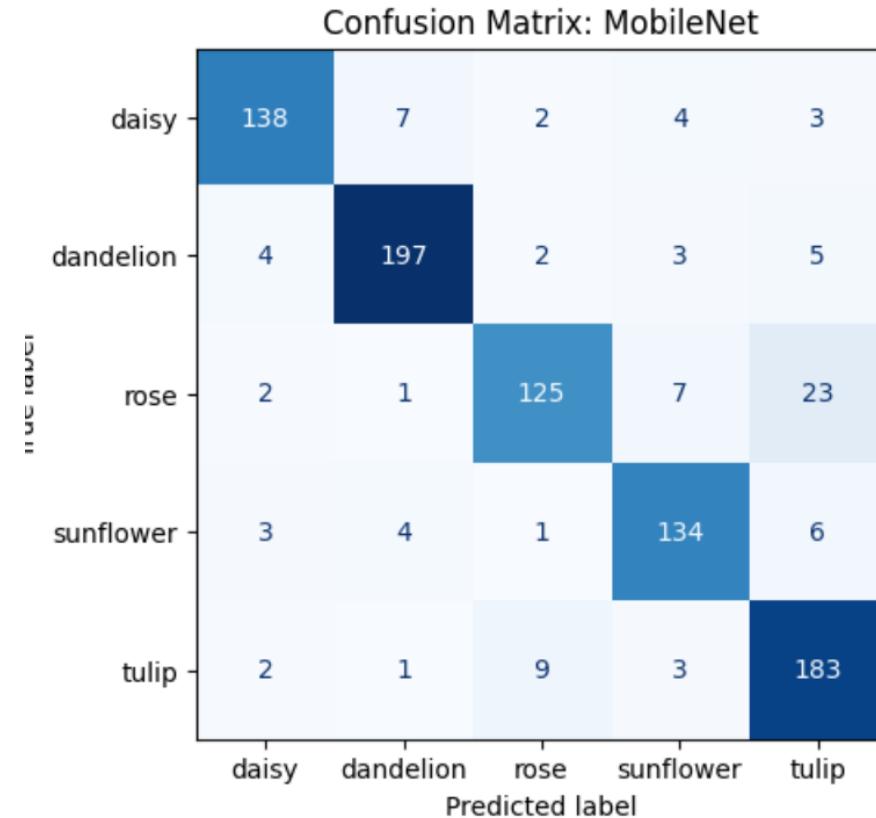
- ResNet50
- VGG19
- Xception
- InceptionV3
- MobileNet

Hyperparameter tuning

- Utilized Keras Tuner to optimize learning rate, dropout, batch size, and number of trainable layers.
- Identified the best combination of hyperparameters to enhance accuracy and generalization.



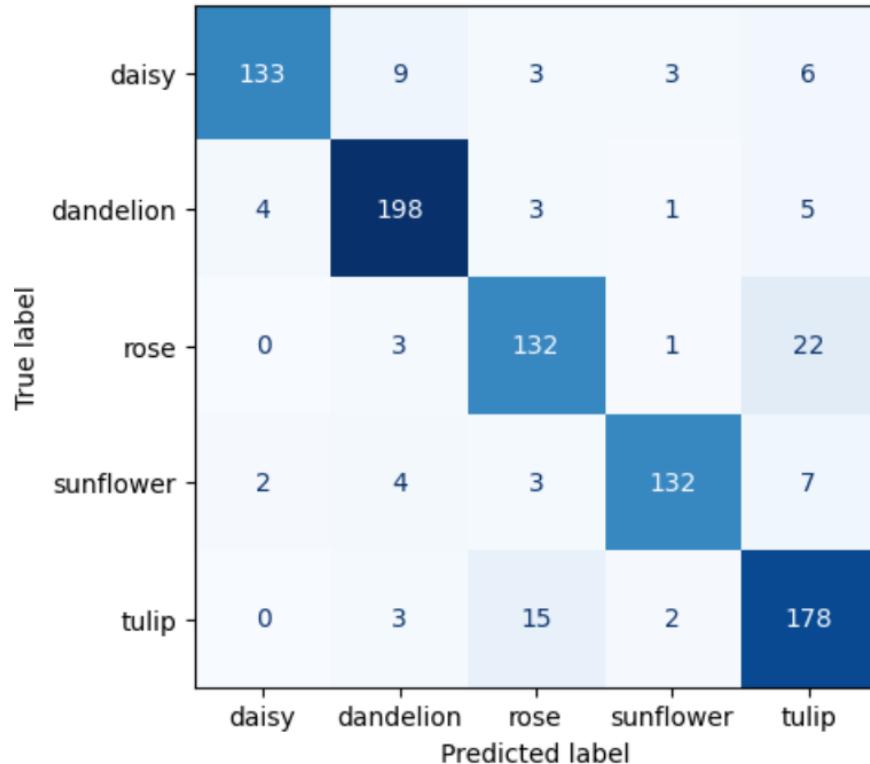
MOBILENET



- High accuracy (89.41%) , validation (88.95%)
- -Confusion matrix shows strong class predictions (minimal misclassification)
- Indicate a stable learning
- Smooth convergence (loss curve decreases steadily)

XCEPTION

Confusion Matrix: Xception

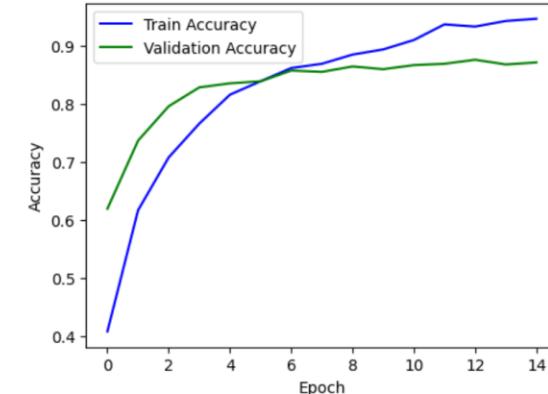


Classification Report for Xception:

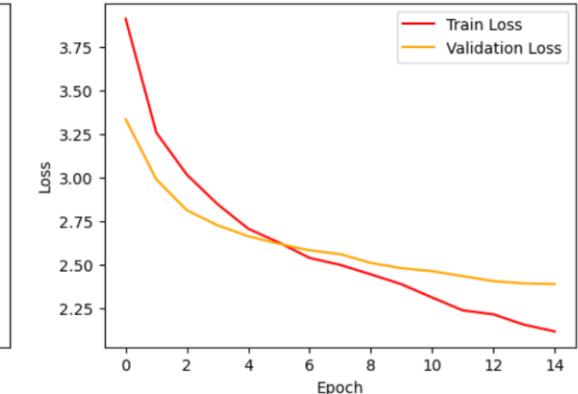
	precision	recall	f1-score	support
daisy	0.96	0.86	0.91	154
dandelion	0.91	0.94	0.93	211
rose	0.85	0.84	0.84	158
sunflower	0.95	0.89	0.92	148
tulip	0.82	0.90	0.86	198
accuracy			0.89	869
macro avg	0.90	0.89	0.89	869
weighted avg	0.89	0.89	0.89	869

Validation Accuracy for Xception: 87.21%
Test Accuracy for Xception: 88.95%

Accuracy for Xception



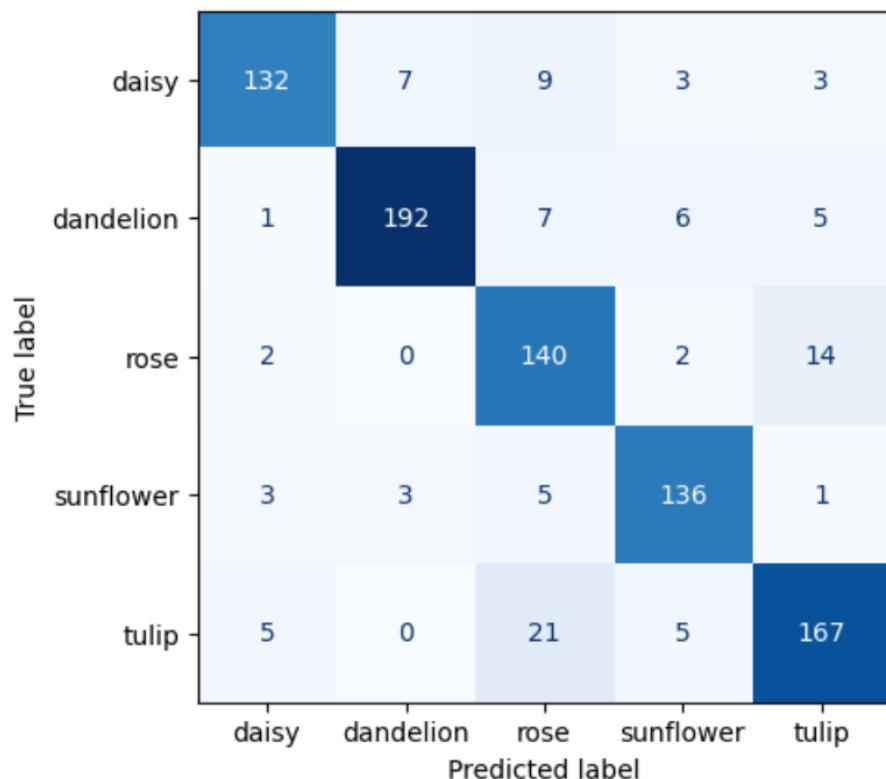
Loss for Xception



- High accuracy (88.85%) , validation (87.21%)
- - Confusion matrix shows strong class predictions (minimal misclassifications)
- Indicate a stable learning
- Smooth convergence (Loss curve decreases gradually without irregularities)

VGG19

Confusion Matrix: VGG19

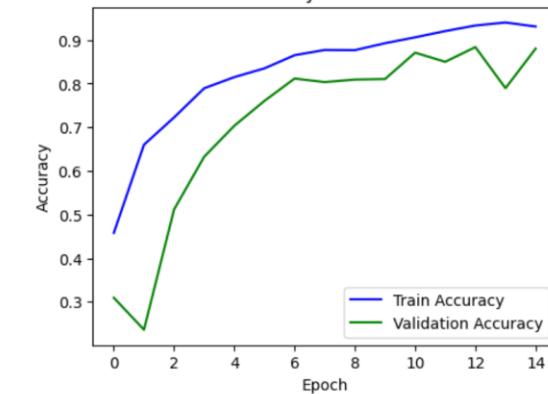


Classification Report for VGG19:

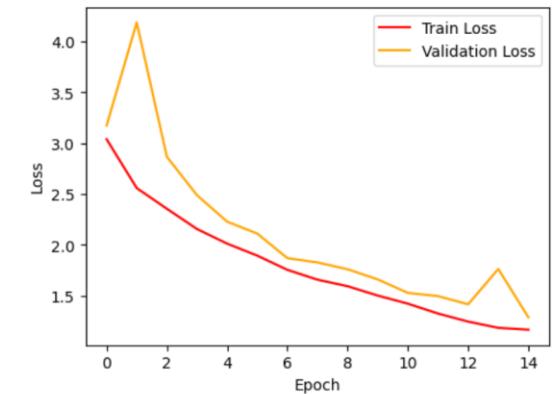
	precision	recall	f1-score	support
daisy	0.92	0.86	0.89	154
dandelion	0.95	0.91	0.93	211
rose	0.77	0.89	0.82	158
sunflower	0.89	0.92	0.91	148
tulip	0.88	0.84	0.86	198
accuracy			0.88	869
macro avg	0.88	0.88	0.88	869
weighted avg	0.89	0.88	0.88	869

Validation Accuracy for VGG19: 88.02%
Test Accuracy for VGG19: 88.26%

Accuracy for VGG19



Loss for VGG19



- High accuracy (88.26%) , validation (88.02%)
- - Confusion matrix shows strong class predictions (cross) , shows low errors
- Indicate a stable learning (Accuracy improves steadily, though slight overfitting is observed)
- Smooth convergence (loss curve decreases steadily)

AFTER HYPERPARAMETER TUNING - XCEPTION

1. Performance Improvement:

- Test Accuracy: 92.87%
- Validation Accuracy: 91.40%

2. Model Generalization:

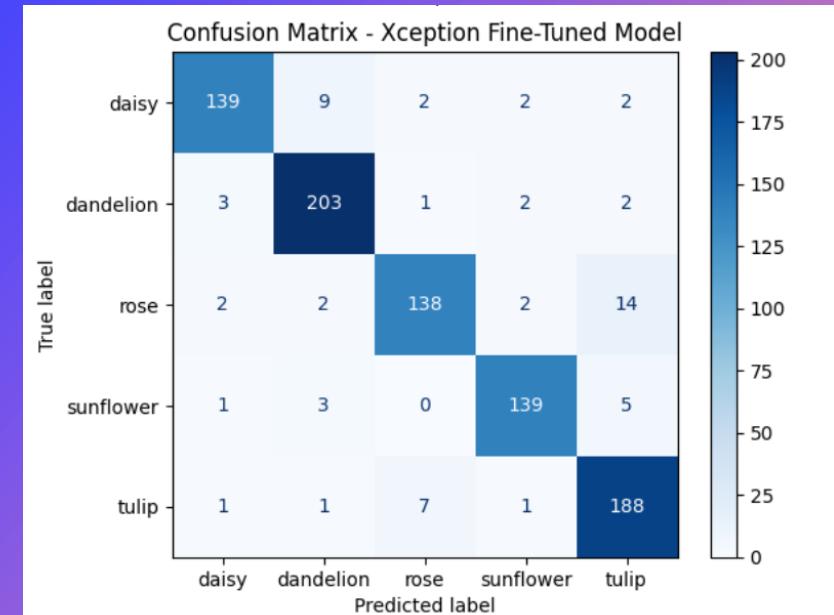
- High precision, recall, and F1-scores (~93%) across all classes
- Confusion matrix shows minimal misclassifications

3. Training:

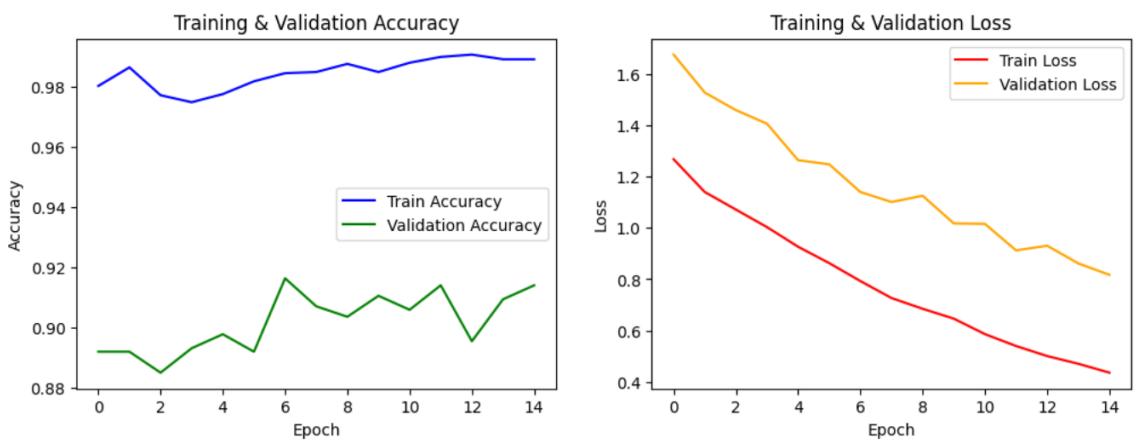
- Validation accuracy fluctuates slightly, showing some instability
- The small gap between training and validation accuracy suggests slight overfitting

In conclusion, the model performs well, showcasing strong learning and minimal overfitting. However, validation stability could be improved with techniques like data augmentation or regularization. Implementing these improvements would further enhance the model's performance, making the fine-tuned Xception model even more robust and suitable for deployment.

Classification Report for Xception Fine-Tuned Model:				
	precision	recall	f1-score	support
daisy	0.95	0.90	0.93	154
dandelion	0.93	0.96	0.95	211
rose	0.93	0.87	0.90	158
sunflower	0.95	0.94	0.95	148
tulip	0.89	0.95	0.92	198
accuracy			0.93	869
macro avg	0.93	0.93	0.93	869
weighted avg	0.93	0.93	0.93	869



27/27 2s 75ms/step - accuracy: 0.9095 - loss: 0.7806
28/28 3s 108ms/step - accuracy: 0.9215 - loss: 0.7727
Validation Accuracy: 91.40%
Test Accuracy: 92.87%



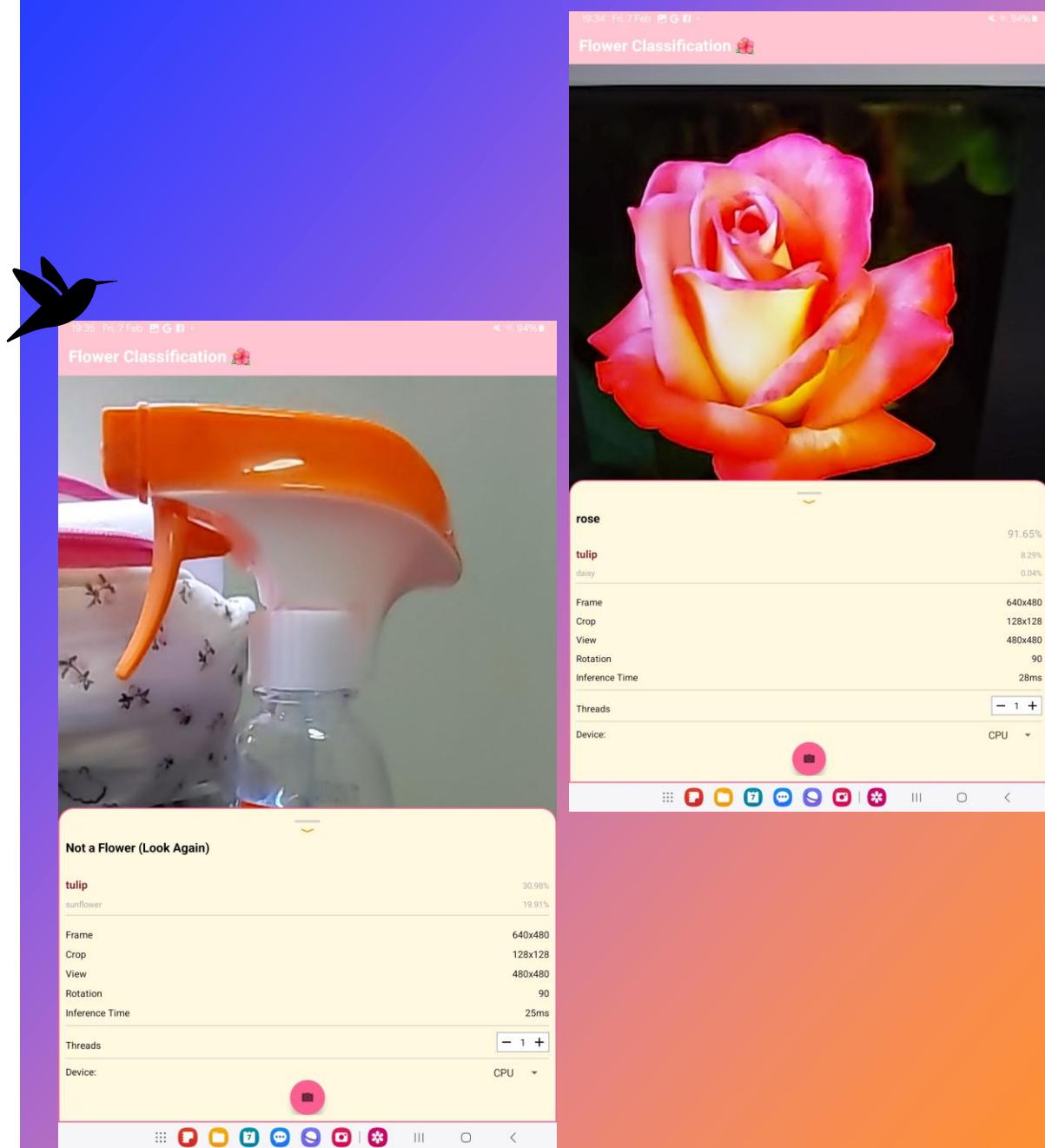
ANDROID DEPLOYMENT

1. Deployed in android studio

- Connect through a physical android device

2. Did some error handling

- If the object detected has less than 50% confidence and is not classified as a flower, it will display the message “Not a flower, try again.”



What went wrong?

- In Part 1 of the assignment, my class balance was not aligned with my test accuracy. This happened because I shuffled my test dataset, which caused the imbalance
- I felt that my Android deployment was basic and lacked advanced features

- **Improvement that I could have done?**
- I should have checked my work thoroughly and retrained the model (trial and error).
- I could have done more design work and implemented additional features in my Android deployment.

CONCLUSION

REFERENCE

- [1] GeeksforGeeks, “Transfer learning & finetuning using Keras,” *GeeksforGeeks*, Jun. 11, 2024.
<https://www.geeksforgeeks.org/transfer-learning-fine-tuning-using-keras/>
- [2] L. O’Sullivan, “Identify Plants With the Flora Incognita App - And Support Important Biological Research,” *Digital for Good / RESET.ORG*, Jun. 12, 2024. <https://en.reset.org/identify-plants-with-the-flora-incognita-app-and-support-research>

THANK YOU

