

# Classifying Animals-10 dataset with CNN and Transfer Learning models

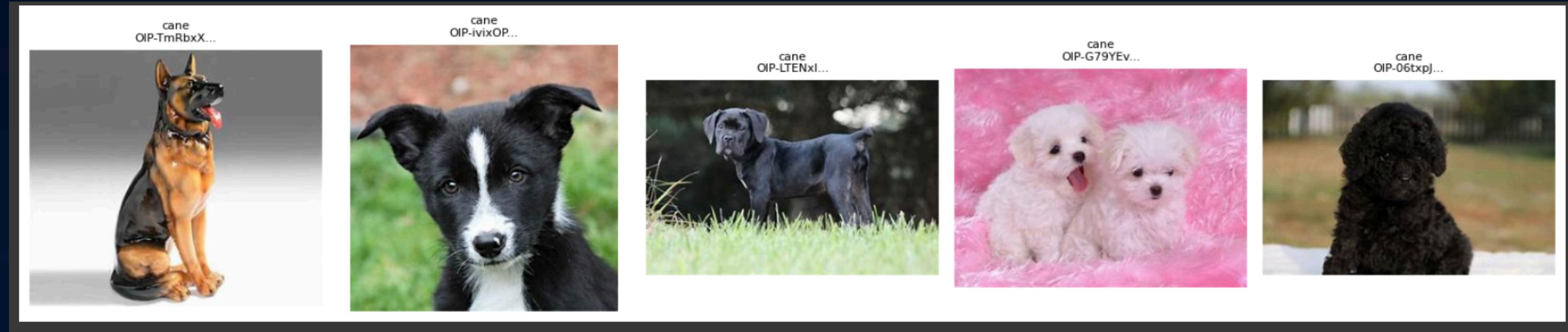
## GROUP 3

- Dr. Priyadharshini Arunachalam
- Abhishek Thummanapelli
- Lovely Ibañez

# Data Set selection

## We chose Animals - 10 dataset

- The Animal-10 dataset is more appropriate because it has larger, realistic images



- Fits well with MobileNetV2, ResNet18.

# Visualising the last 5 images from each class

Gallina



Pecora



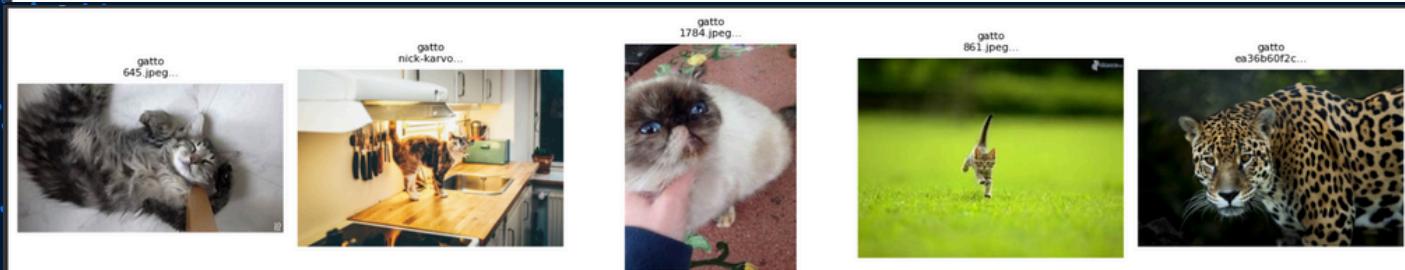
Cavalo



Cane



Gatto



Scoiattolo



Ragno



Elefante



Farfalla



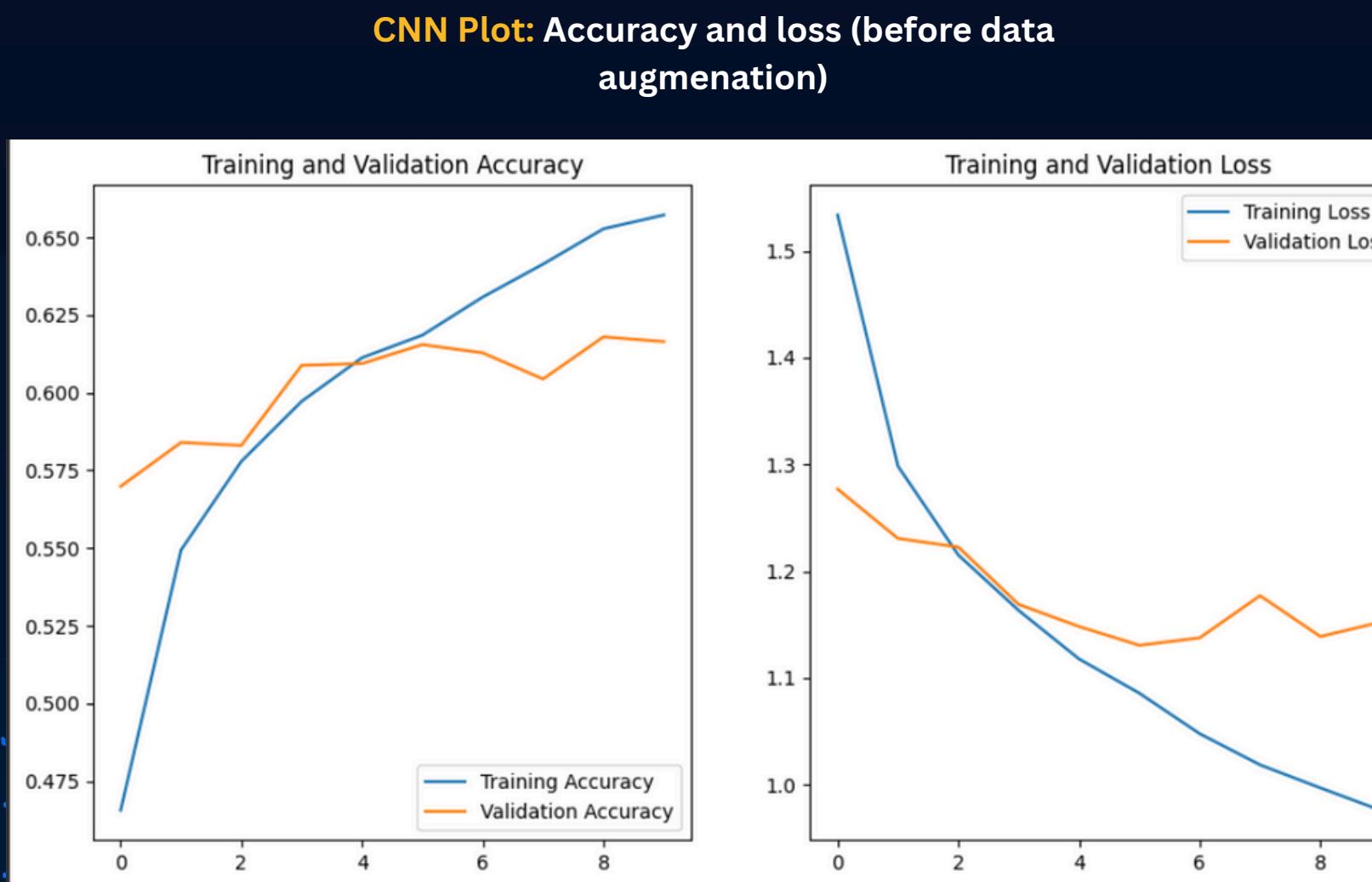
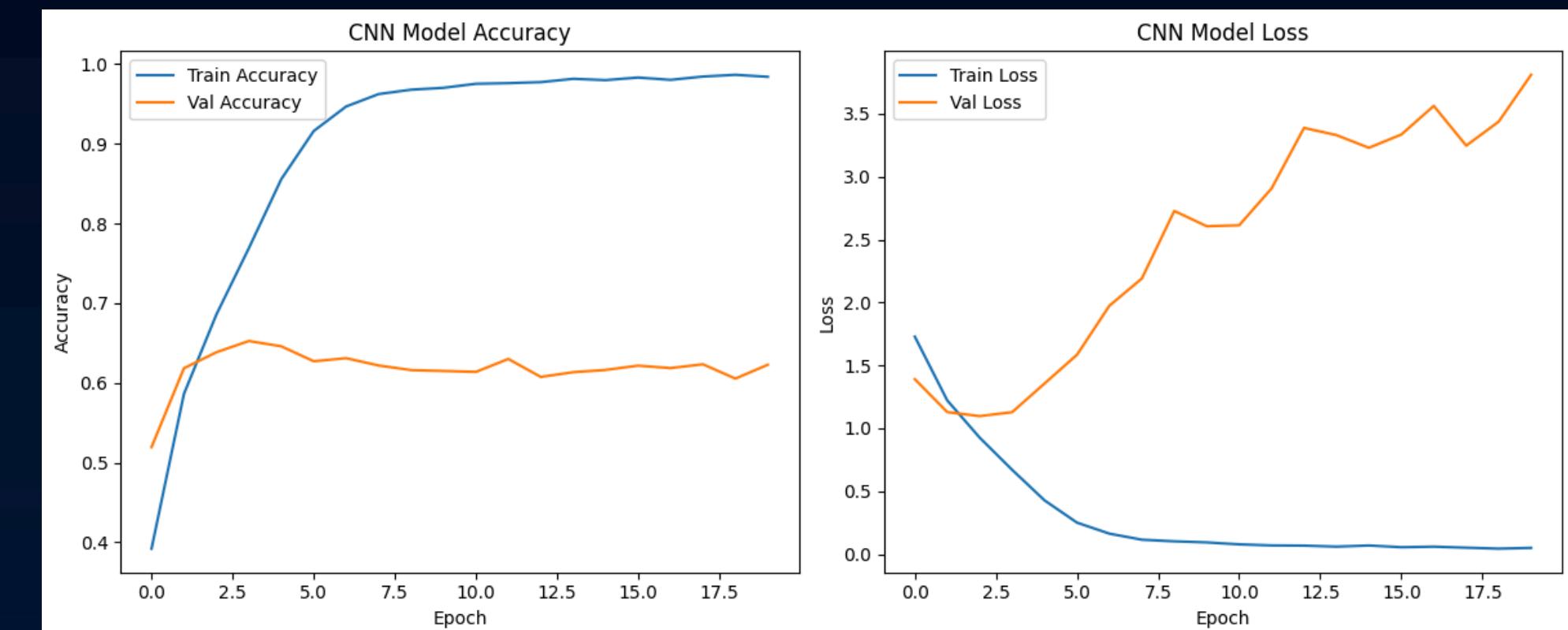
Mucca



# Model Architecture

- Model Architecture (Custom CNN)
- 2–3 Conv2D layers + MaxPooling
- Dropout to prevent overfitting
- Dense layer(s) and softmax output

**CNN Plot: Accuracy and loss  
(after data augmentation)**



```
Epoch 1/20
1309/1309 55s 23ms/step - accuracy: 0.3532 - loss: 1.8460 - val_accuracy: 0.5851 - val_loss: 1.2340
Epoch 2/20
1309/1309 78s 24ms/step - accuracy: 0.6272 - loss: 1.1125 - val_accuracy: 0.6254 - val_loss: 1.0977
Epoch 3/20
1309/1309 73s 18ms/step - accuracy: 0.7515 - loss: 0.7324 - val_accuracy: 0.6489 - val_loss: 1.1020
Epoch 4/20
1309/1309 38s 17ms/step - accuracy: 0.8581 - loss: 0.4095 - val_accuracy: 0.6447 - val_loss: 1.3307
Epoch 5/20
1309/1309 36s 18ms/step - accuracy: 0.9384 - loss: 0.1922 - val_accuracy: 0.6277 - val_loss: 1.8309
```

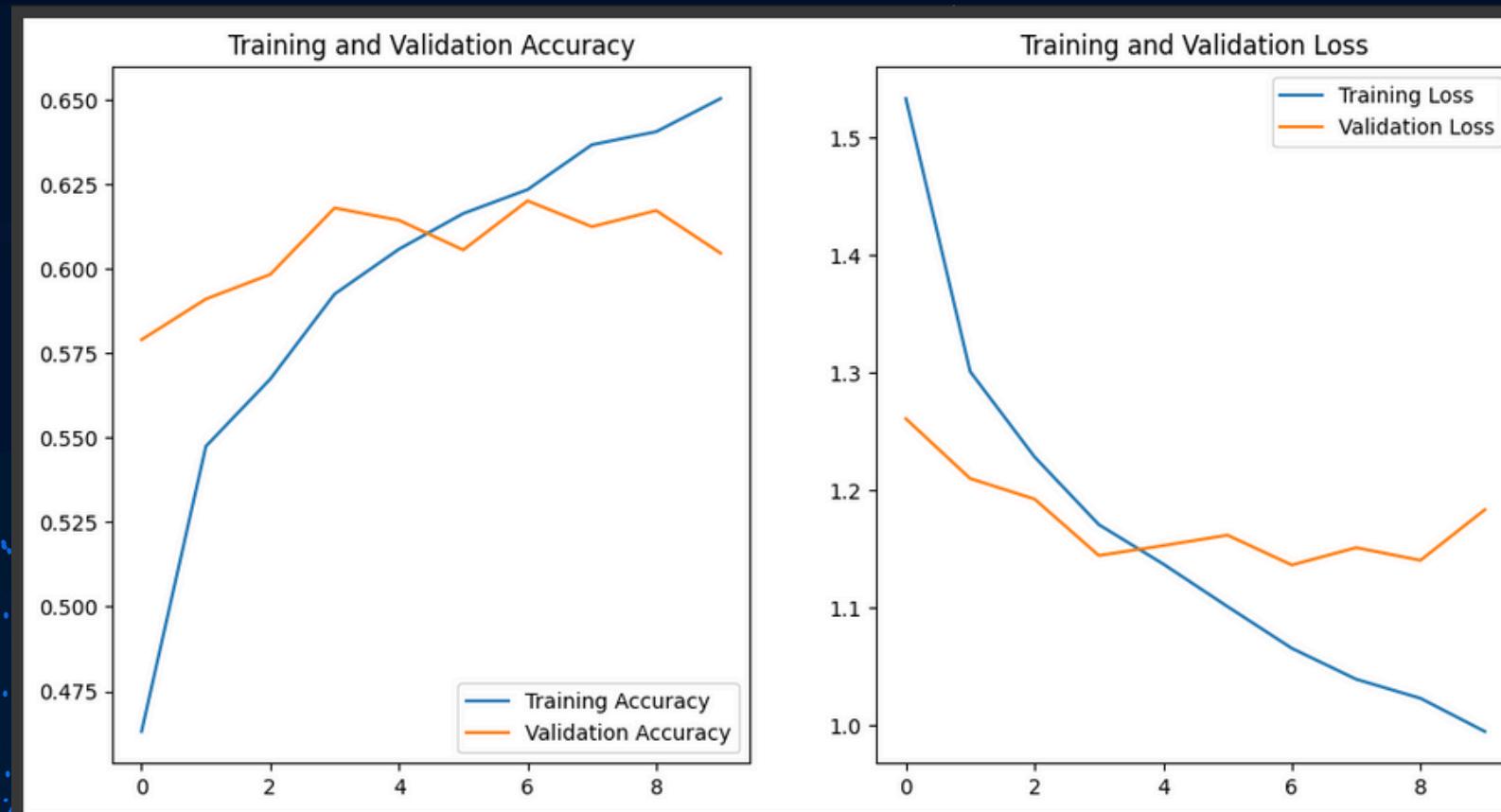
```
Epoch 1/20
1309/1309 41s 22ms/step - accuracy: 0.7571 - loss: 0.7228 - val_accuracy: 0.6527 - val_loss: 1.0821
Epoch 2/20
1309/1309 75s 18ms/step - accuracy: 0.8579 - loss: 0.4312 - val_accuracy: 0.6266 - val_loss: 1.3459
Epoch 3/20
1309/1309 41s 17ms/step - accuracy: 0.9311 - loss: 0.2181 - val_accuracy: 0.6338 - val_loss: 1.7724
Epoch 4/20
1309/1309 47s 22ms/step - accuracy: 0.9577 - loss: 0.1269 - val_accuracy: 0.6332 - val_loss: 1.9185
Epoch 5/20
1309/1309 36s 18ms/step - accuracy: 0.9747 - loss: 0.0768 - val_accuracy: 0.6342 - val_loss: 2.2542
Epoch 6/20
1309/1309 36s 18ms/step - accuracy: 0.9752 - loss: 0.0717 - val_accuracy: 0.6416 - val_loss: 2.5185
Epoch 7/20
1309/1309 43s 18ms/step - accuracy: 0.9778 - loss: 0.0713 - val_accuracy: 0.6334 - val_loss: 2.4369
Epoch 8/20
1309/1309 40s 19ms/step - accuracy: 0.9839 - loss: 0.0501 - val_accuracy: 0.6132 - val_loss: 2.8047
Epoch 9/20
1309/1309 35s 18ms/step - accuracy: 0.9808 - loss: 0.0637 - val_accuracy: 0.6332 - val_loss: 2.8107
Epoch 10/20
1309/1309 35s 18ms/step - accuracy: 0.9825 - loss: 0.0543 - val_accuracy: 0.6290 - val_loss: 3.2246
Epoch 11/20
1309/1309 36s 18ms/step - accuracy: 0.9835 - loss: 0.0526 - val_accuracy: 0.6275 - val_loss: 3.1431
Epoch 12/20
1309/1309 41s 18ms/step - accuracy: 0.9842 - loss: 0.0509 - val_accuracy: 0.6128 - val_loss: 3.1491
Epoch 13/20
```

# Transfer Learning Models

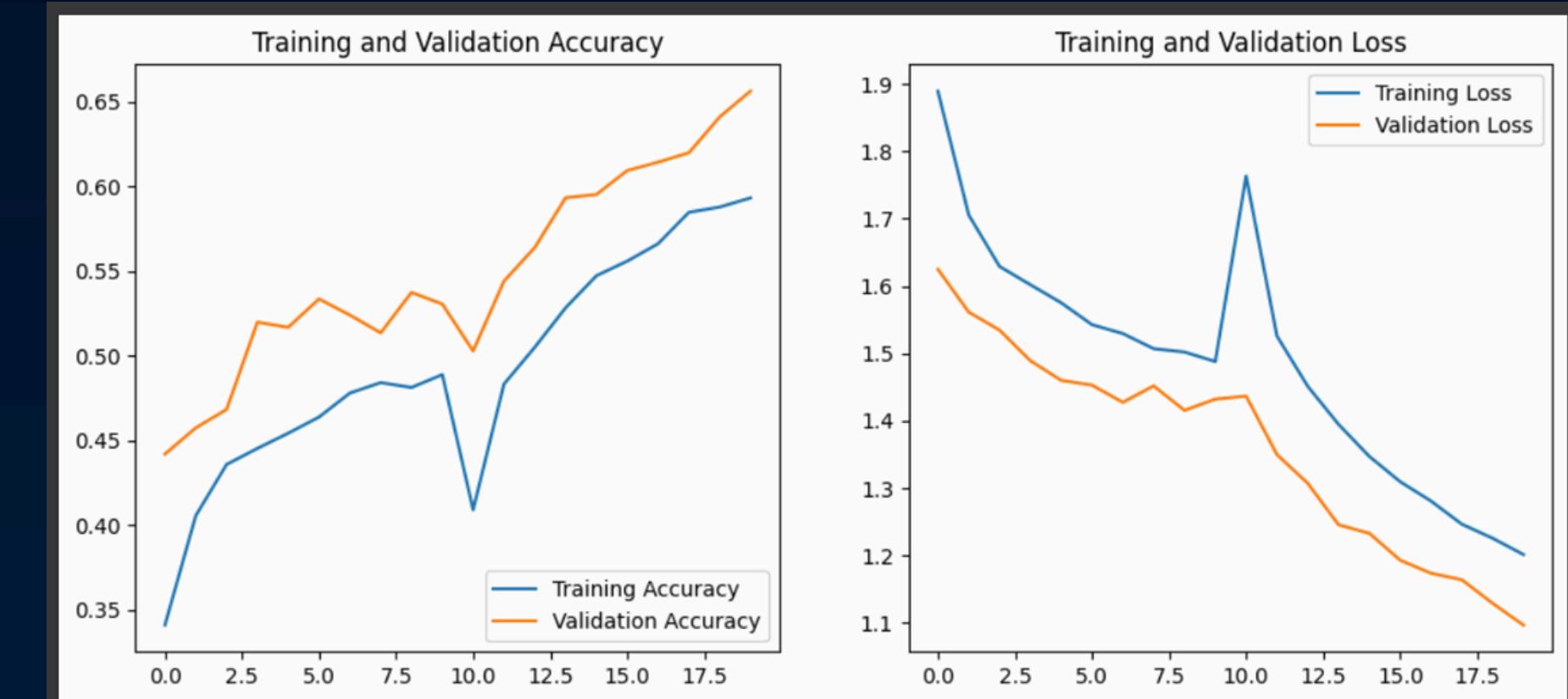
**MobileNetV2: lightweight and efficient**

**ResNet50: deeper with residual connections to prevent vanishing gradients**

**MobileNet Plot: Accuracy and loss  
(before data augmentation)**



**MobileNet Plot: Accuracy and loss  
(after data augmentation)**



# Before Data augmentation

```
1389/1389 ━━━━━━━━━━ 45s 19ms/step - accuracy: 0.6093 - loss: 1.1254 - val_accuracy: 0.6143 - val_loss: 1.1528
Epoch 6/10
1389/1389 ━━━━━━━━━━ 31s 14ms/step - accuracy: 0.6172 - loss: 1.0954 - val_accuracy: 0.6055 - val_loss: 1.1617
Epoch 7/10
1389/1389 ━━━━━━━━━━ 33s 16ms/step - accuracy: 0.6266 - loss: 1.0620 - val_accuracy: 0.6201 - val_loss: 1.1363
Epoch 8/10
1389/1389 ━━━━━━━━━━ 31s 15ms/step - accuracy: 0.6387 - loss: 1.0308 - val_accuracy: 0.6124 - val_loss: 1.1511
Epoch 9/10
1389/1389 ━━━━━━━━━━ 31s 14ms/step - accuracy: 0.6408 - loss: 1.0191 - val_accuracy: 0.6172 - val_loss: 1.1493
Epoch 10/10
1389/1389 ━━━━━━━━━━ 47s 19ms/step - accuracy: 0.6547 - loss: 0.9801 - val_accuracy: 0.6046 - val_loss: 1.1834
```

# After Data augmentation

```
Epoch 6/10  
1309/1309 49s 25ms/step - accuracy: 0.7111 - loss: 0.8451 - val_accuracy: 0.6764 - val_loss: 0.9740  
Epoch 7/10  
1309/1309 83s 24ms/step - accuracy: 0.7361 - loss: 0.7738 - val_accuracy: 0.6904 - val_loss: 0.9599  
Epoch 8/10  
1309/1309 49s 25ms/step - accuracy: 0.7488 - loss: 0.7195 - val_accuracy: 0.6978 - val_loss: 0.9414  
Epoch 9/10  
1309/1309 45s 22ms/step - accuracy: 0.7712 - loss: 0.6620 - val_accuracy: 0.6999 - val_loss: 0.9306  
Epoch 10/10  
1309/1309 46s 23ms/step - accuracy: 0.7892 - loss: 0.6061 - val_accuracy: 0.7053 - val_loss: 0.9236
```

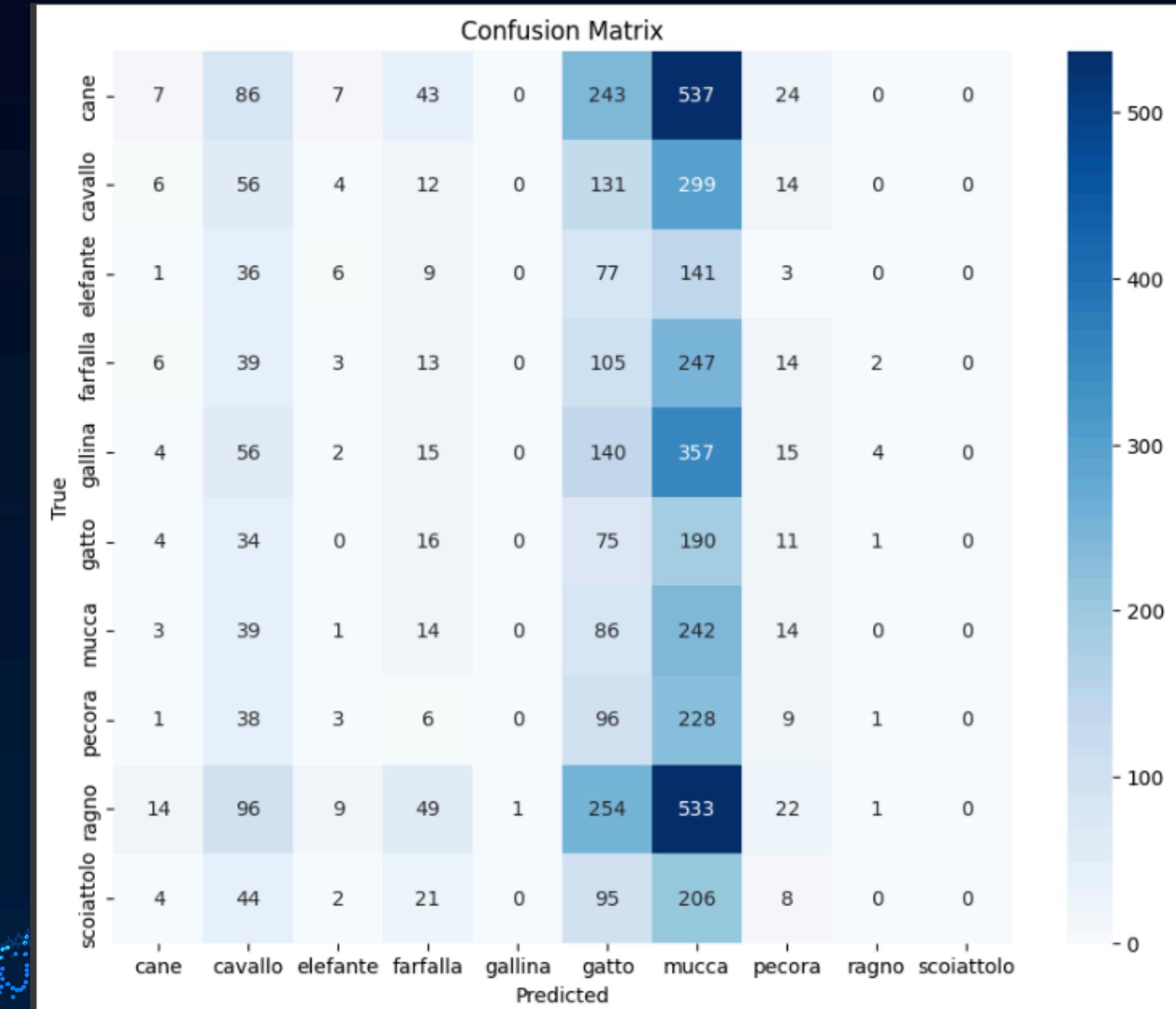
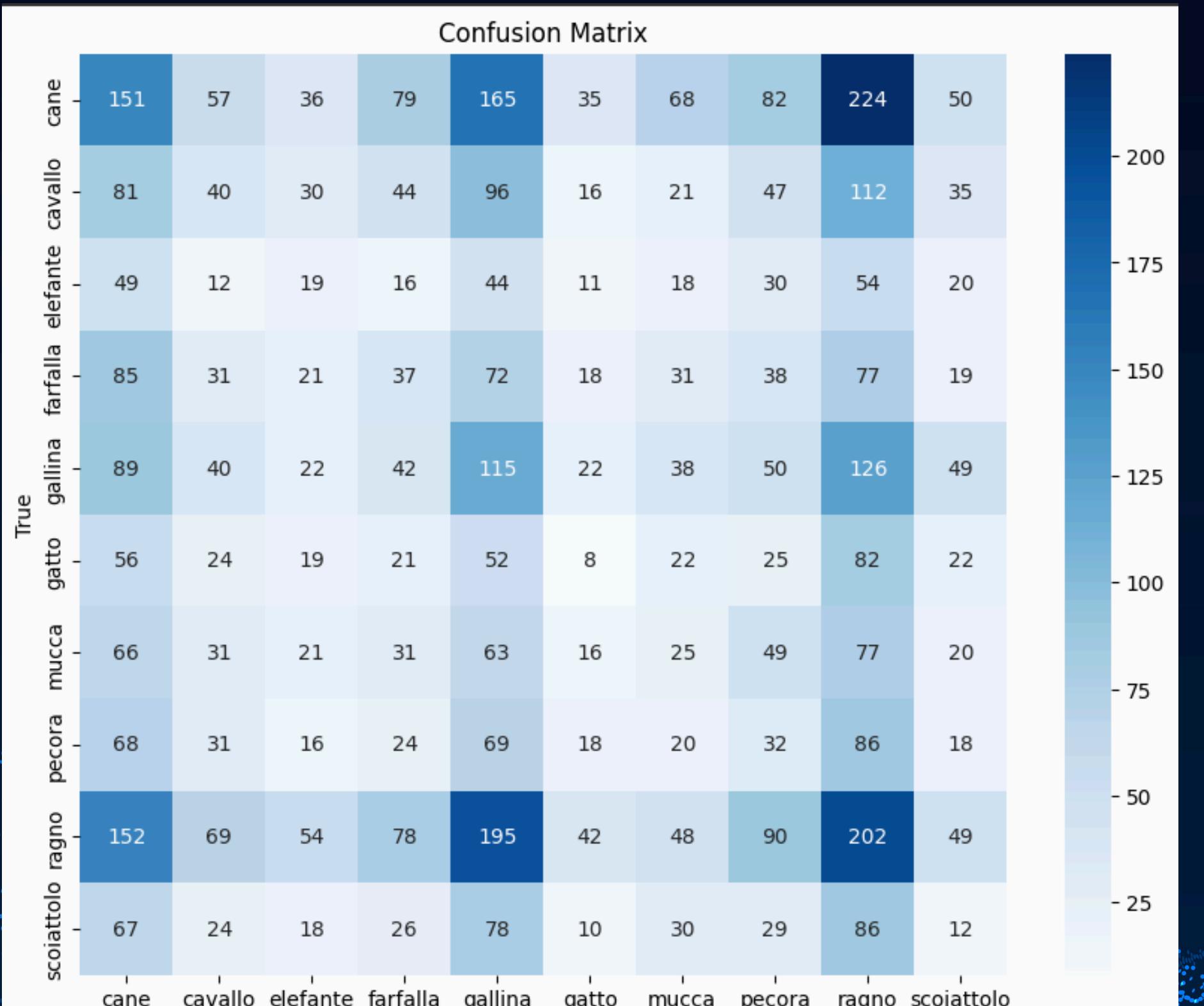
# After fine tuning

```
Epoch 16/20  
1309/1309 ━━━━━━━━━━ 85s 24ms/step - accuracy: 0.7264 - loss: 0.8013 - val_accuracy: 0.6816 - val_loss: 0.9914  
Epoch 17/20  
1309/1309 ━━━━━━━━━━ 82s 25ms/step - accuracy: 0.7498 - loss: 0.7354 - val_accuracy: 0.6877 - val_loss: 0.9820  
Epoch 18/20  
1309/1309 ━━━━━━━━━━ 45s 22ms/step - accuracy: 0.7648 - loss: 0.6702 - val_accuracy: 0.6934 - val_loss: 0.9723  
Epoch 19/20  
1309/1309 ━━━━━━━━━━ 46s 22ms/step - accuracy: 0.7830 - loss: 0.6283 - val_accuracy: 0.6951 - val_loss: 0.9677  
Epoch 20/20  
1309/1309 ━━━━━━━━━━ 82s 22ms/step - accuracy: 0.8011 - loss: 0.5663 - val_accuracy: 0.6951 - val_loss: 0.9750  
Training time for epochs 9 to 20: 11.84 minutes
```

# CONFUSION MATRIX

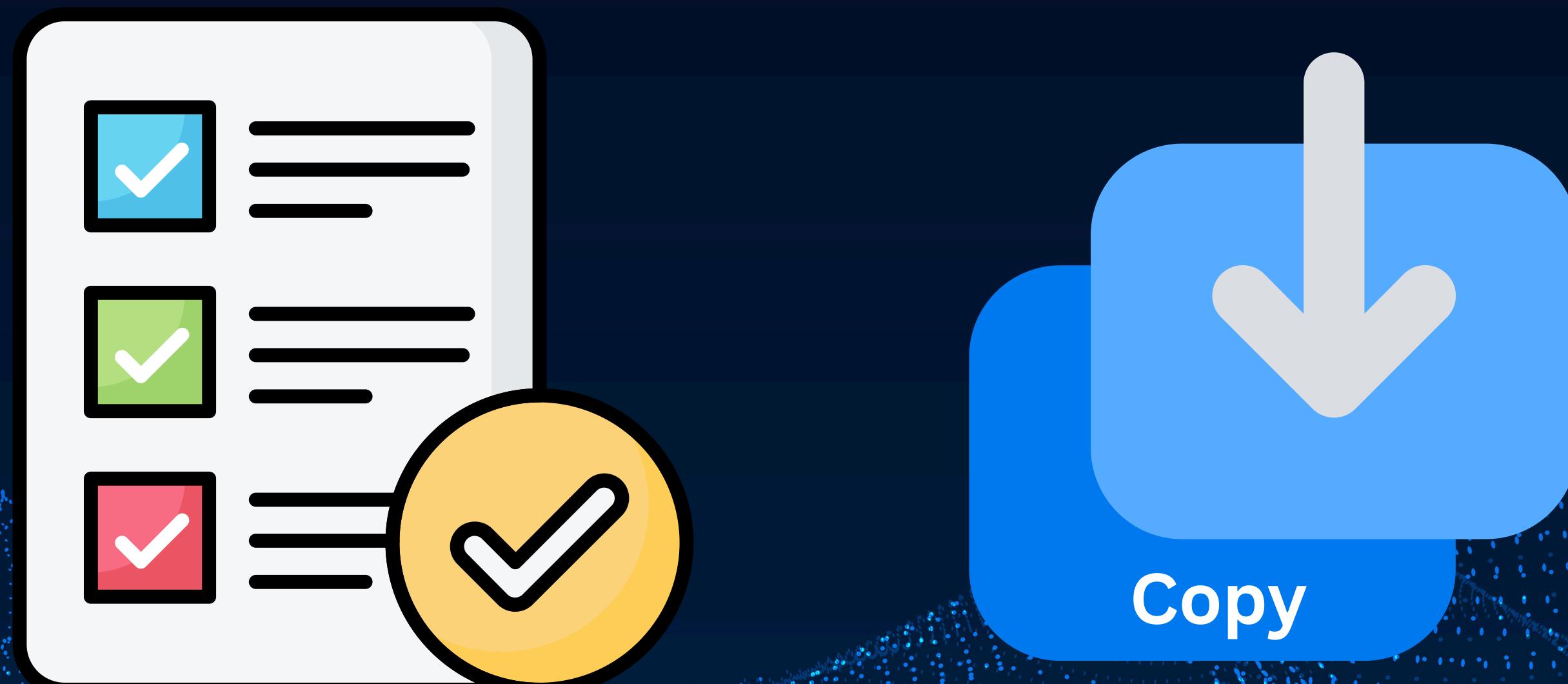
MobileNetV2

ResNet50



# Teamwork & Project Management

Followed Refractor method





# Results and Conclusion



# TEST OUT APP

