

Plant Seedlings Classification

CHEUK HANG NG (A1821087)

Outline

- Introduction
- Methodology
- Results
- Discussion

Introduction

- Plant seedlings classification
 - Dataset downloaded from Kaggle
 - Aim: distinguish the species of the plant from a photo
- Dataset
 - 4,750 images from 12 species provided for training
 - 794 images to predict

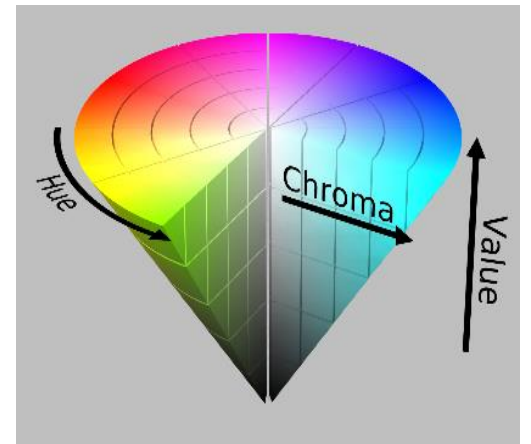
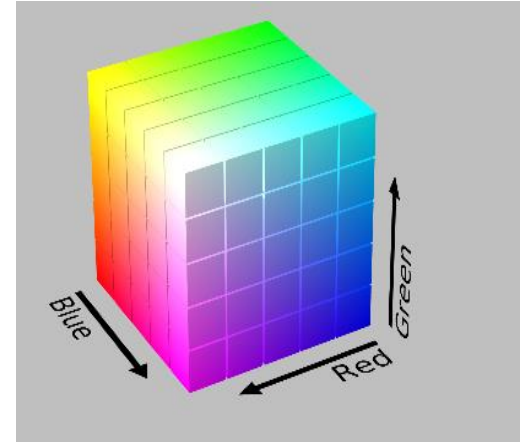
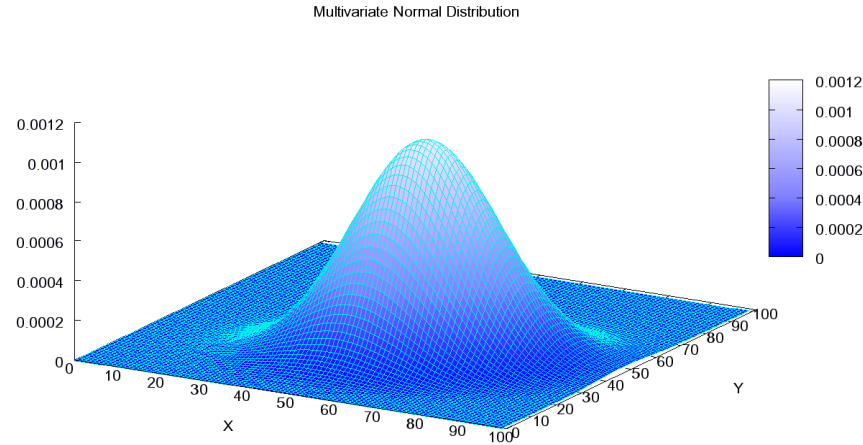
Methodology

- Exploratory Data Analysis
 - Plotting sample images
 - Plotting number of images for each species

Methodology

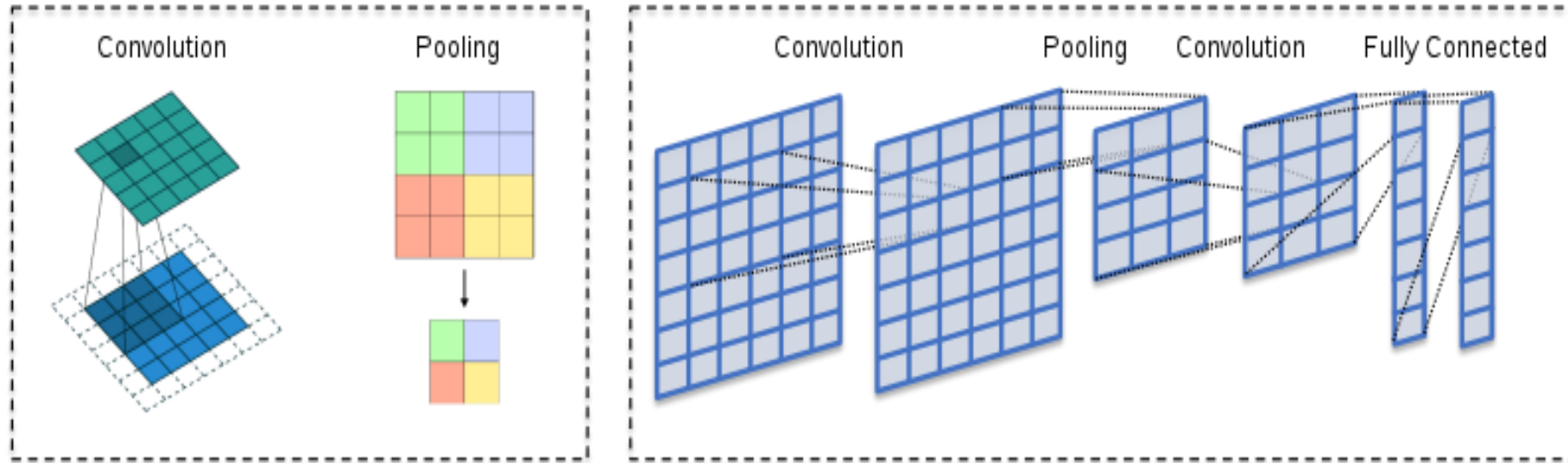
- Data Preprocessing

- Resize
- Masking
 - Gaussian Blur
 - HSV color mask (25, 30, 40) to (85, 255, 255)
 - `cv2.getStructuringElement(cv2.MORPH_ELLIPSE((11,11)))`
 - Isolating only the plants in the photo
- Train-test split (0.85, 0.15)



Methodology

- Convolutional Neural Network (CNN)



Methodology

- The models

- From scratch CNN model
- VGG16
- ResNet50
- InceptionV3
- Xception
- EfficientNetB0

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 76, 76, 64)	4864
batch_normalization (Batch Normalization)	(None, 76, 76, 64)	256
conv2d_1 (Conv2D)	(None, 72, 72, 64)	102464
max_pooling2d (MaxPooling2D)	(None, 36, 36, 64)	0
batch_normalization_1 (Batch Normalization)	(None, 36, 36, 64)	256
dropout (Dropout)	(None, 36, 36, 64)	0
conv2d_2 (Conv2D)	(None, 32, 32, 128)	204928
batch_normalization_2 (Batch Normalization)	(None, 32, 32, 128)	512
conv2d_3 (Conv2D)	(None, 28, 28, 128)	409728
max_pooling2d_1 (MaxPooling2D)	(None, 14, 14, 128)	0
batch_normalization_3 (Batch Normalization)	(None, 14, 14, 128)	512
dropout_1 (Dropout)	(None, 14, 14, 128)	0
conv2d_4 (Conv2D)	(None, 10, 10, 256)	819456
batch_normalization_4 (Batch Normalization)	(None, 10, 10, 256)	1024
conv2d_5 (Conv2D)	(None, 6, 6, 256)	1638656
max_pooling2d_2 (MaxPooling2D)	(None, 3, 3, 256)	0
batch_normalization_5 (Batch Normalization)	(None, 3, 3, 256)	1024
dropout_2 (Dropout)	(None, 3, 3, 256)	0
flatten (Flatten)	(None, 2304)	0
dense (Dense)	(None, 256)	590080
batch_normalization_6 (Batch Normalization)	(None, 256)	1024
dropout_3 (Dropout)	(None, 256)	0
dense_1 (Dense)	(None, 256)	65792
batch_normalization_7 (Batch Normalization)	(None, 256)	1024
dropout_4 (Dropout)	(None, 256)	0
dense_2 (Dense)	(None, 12)	3084

Total params: 3,844,684
Trainable params: 3,841,868
Non-trainable params: 2,816

Methodology

- Inputs:
 - ImageDataGenerator
- Metrics
 - Loss and Accuracy
 - Loss: categorical_crossentropy()
 - Accuracy: Ratio of correct predictions to true classes
- Confusion Matrix

```
###VGG16 model

#define 2 generators for image sets with / without augmentations

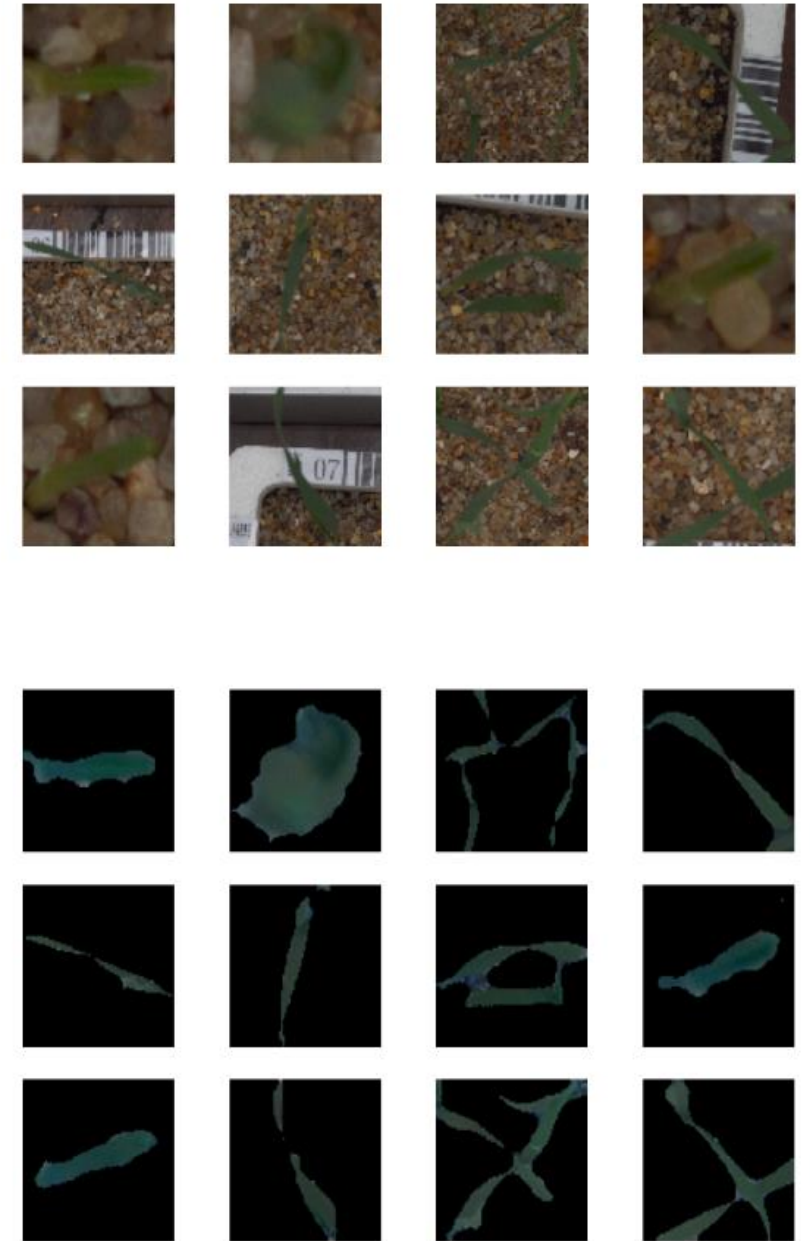
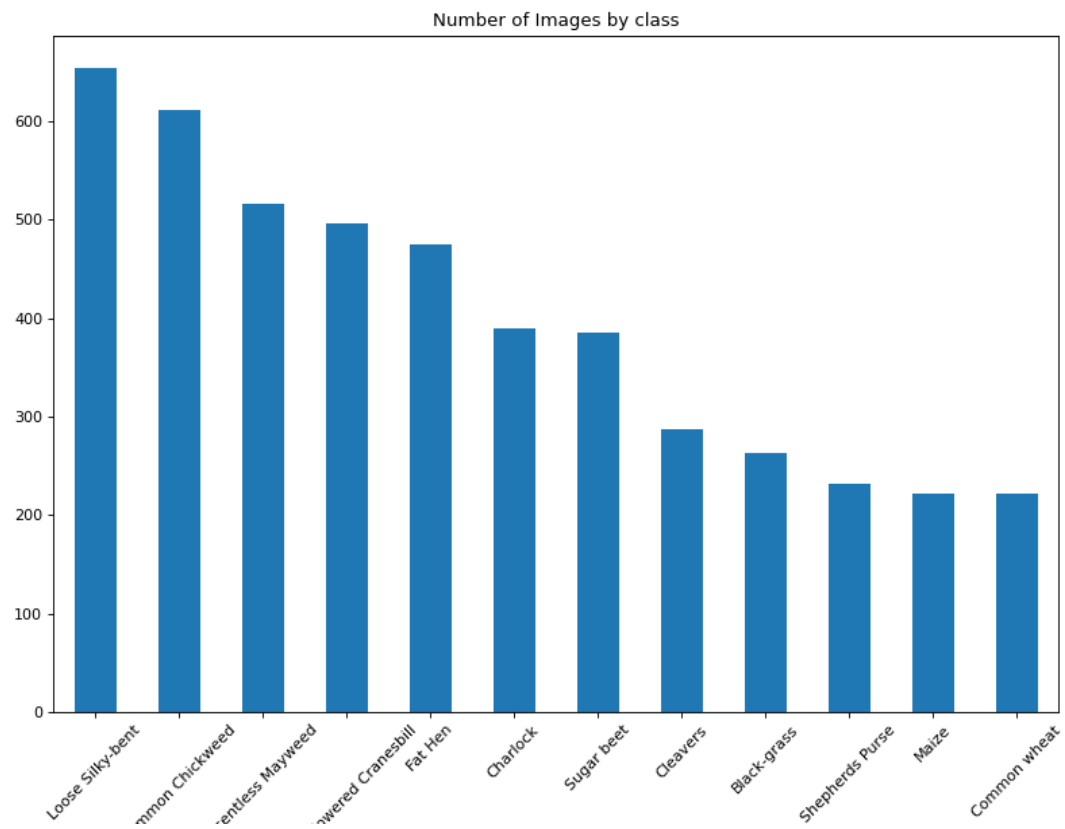
#train set
datagen = ImageDataGenerator(preprocessing_function = vgg_preprocess_input)

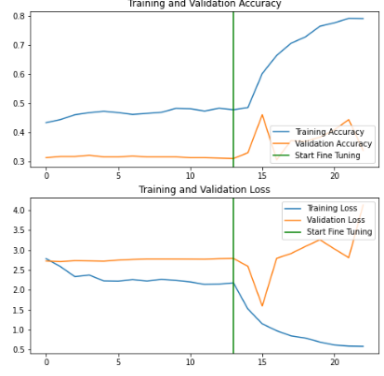
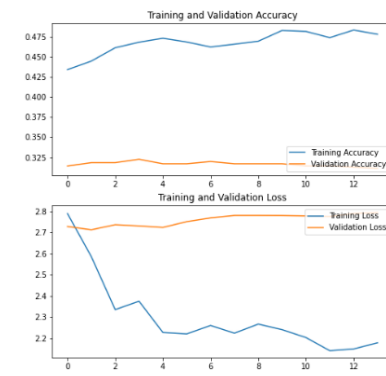
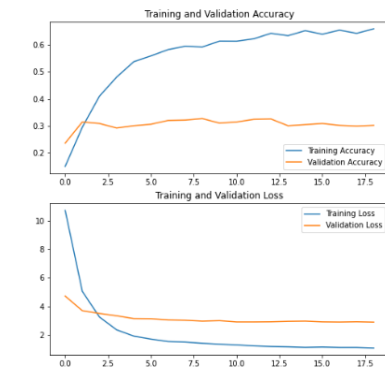
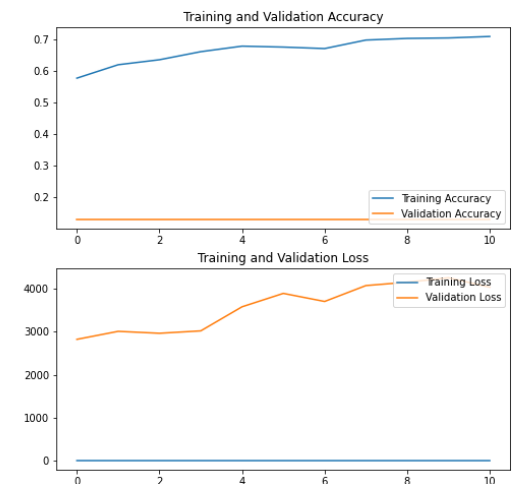
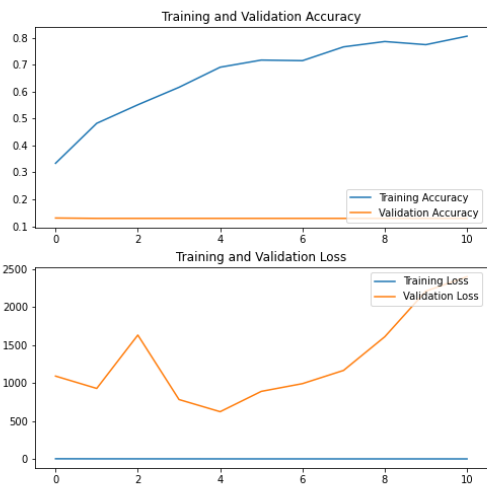
#augmented train set
aug_datagen = ImageDataGenerator(rotation_range = 90, width_shift_range = 0.2, height_shift_range = 0.2,
                                zoom_range = 0.2, horizontal_flip = True, vertical_flip = True, preprocessing_function = vgg_preprocess_input)

datagen.fit(trainX)
aug_datagen.fit(trainX)
```


Results

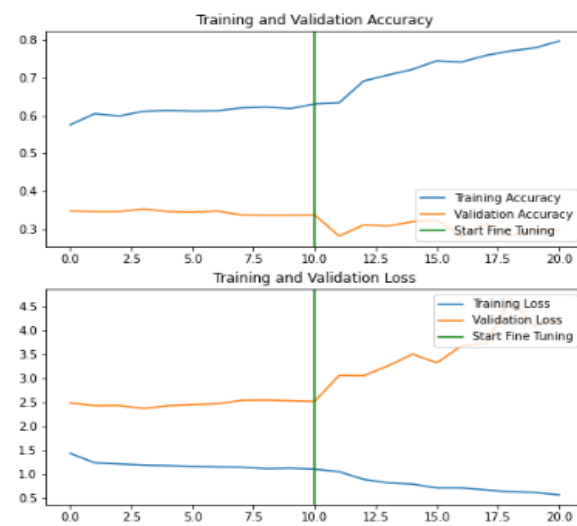
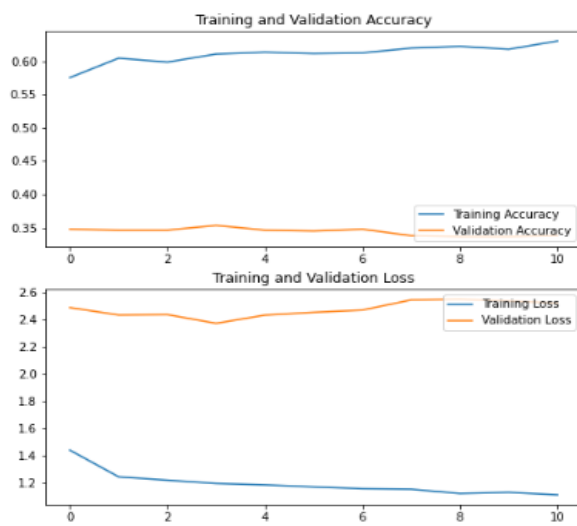
- 80x80 input size



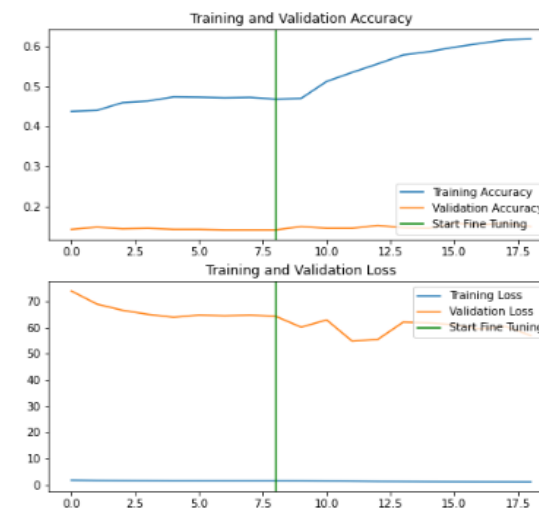
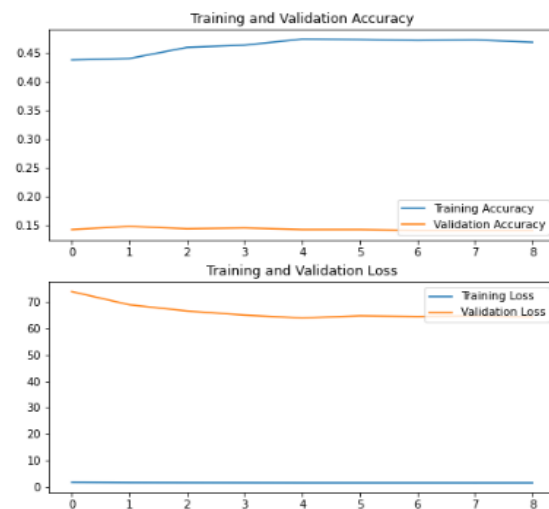


VGG16

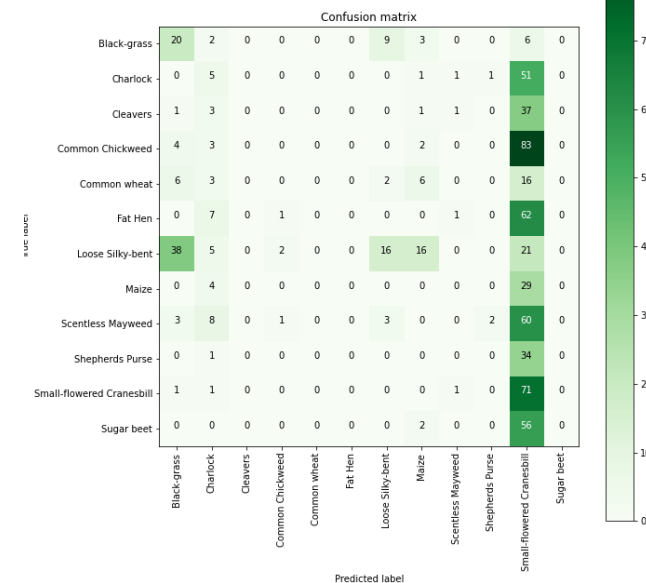
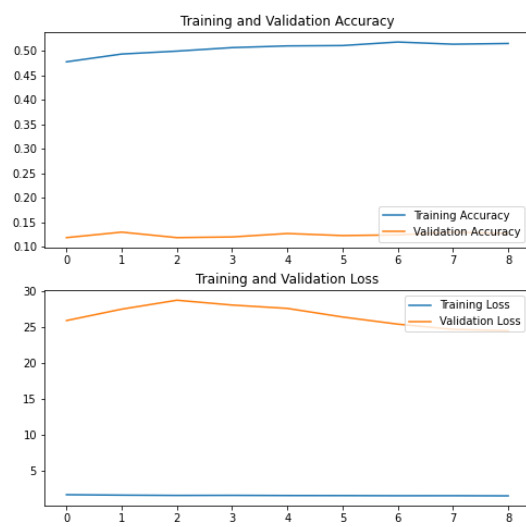
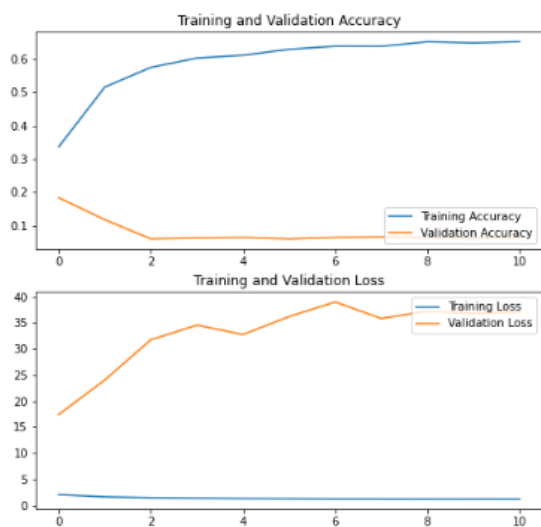
From scratch model



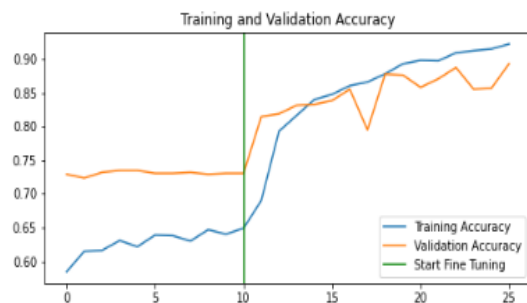
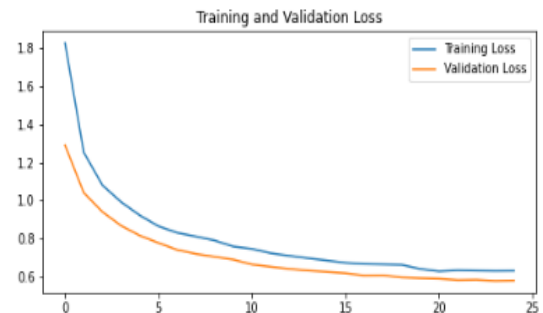
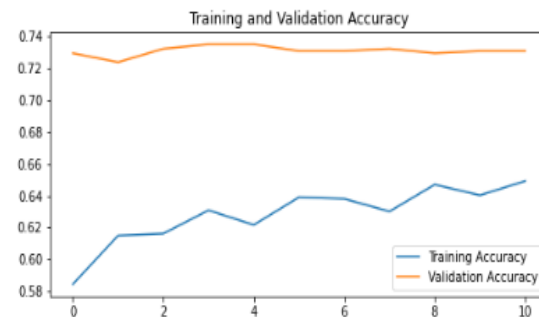
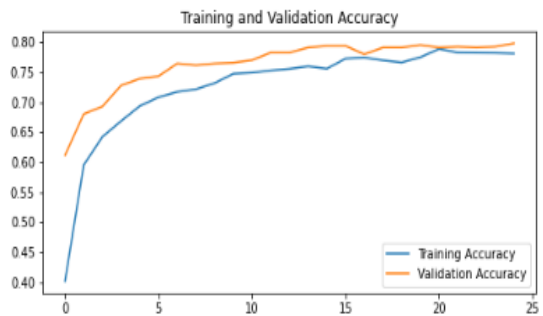
ResNet50



InceptionV3



Xception



EfficientNetB0

