أكاديمية طويق
TUWAIQ ACADEMY

TASK7 :WEEK7

WASTE CLASSIFICATION DATA

PRESENTED BY : SAFA, AREEJ, NEDAA

أكاديمية سدايا
SDAIA Academy

SDAIA
الهيئة السعودية للبيانات والذكاء الاصطناعي
Saudi Data & AI Authority

WHAT WILL DISCUSS?

1. Introduction and overview of dataset

3. Models (CNN , VGG16) comparison and evaluation

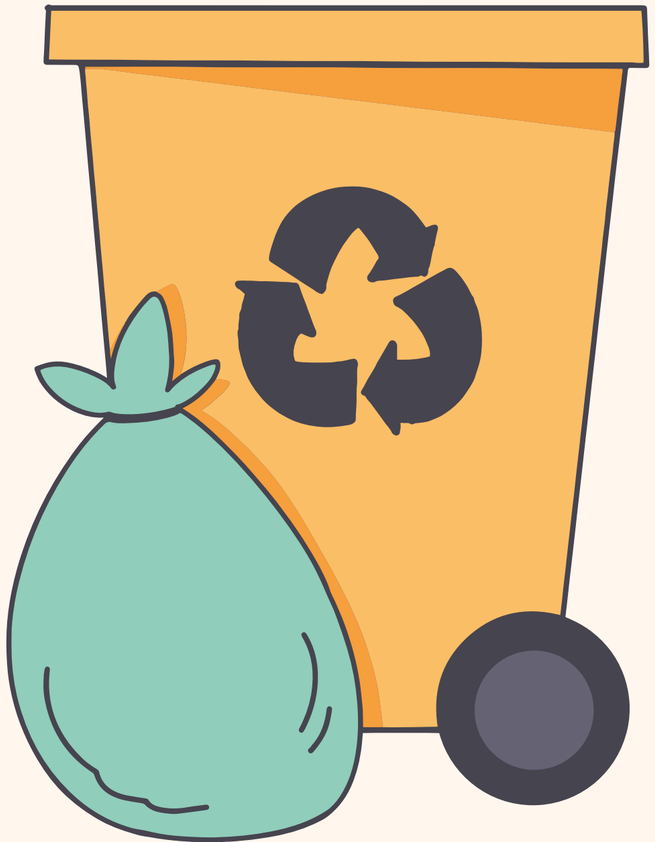
2. Transfer learning model **vs** model trained from scratch

4. Key insights, challenges, and lessons learned

INTRODUCTION

Waste management is a major issue, with *most waste going to landfills, causing problems like* larger landfills, more toxins, and pollution of the land, water, and air. **objective to** searching waste management strategies, analyzing household waste components categorized into **(Organic and Recyclable)**, and using IoT and machine learning to minimize toxic waste in landfills.

OVERVIEW OF DATASET



This dataset contains
22500 images of
Organic & **Recyclable** objects

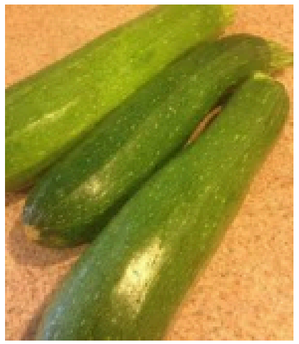
Dataset is divided into
train data (85%)
test data (15%)

DATASET PREPROSSING

Images are read from directories:

- Converted to RGB format,
- Rotation, flipping, and resizing
- Data frames are created for analysis and processing.

This image is of O



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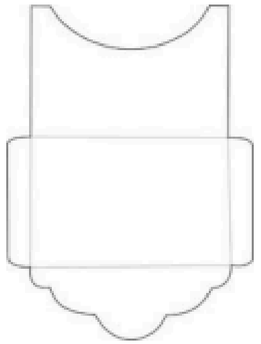

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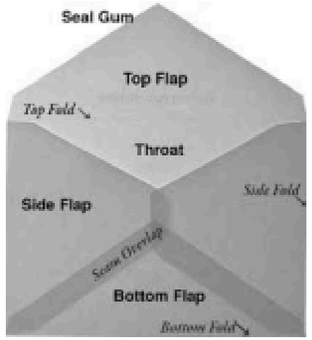

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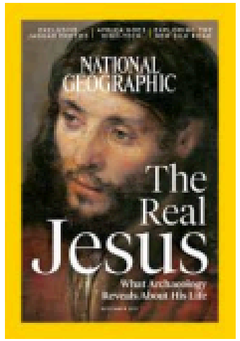
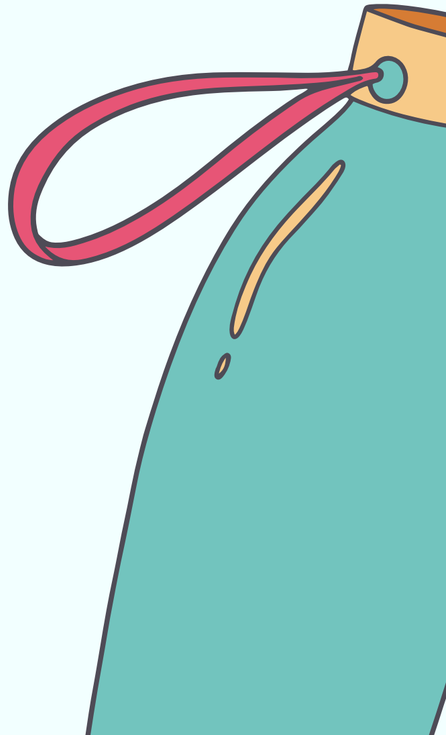


O : ORGANIC , **R** : RECYCLABLE

SCAN BARCODE AND UPLOAD IMAGES

CNN MODEL

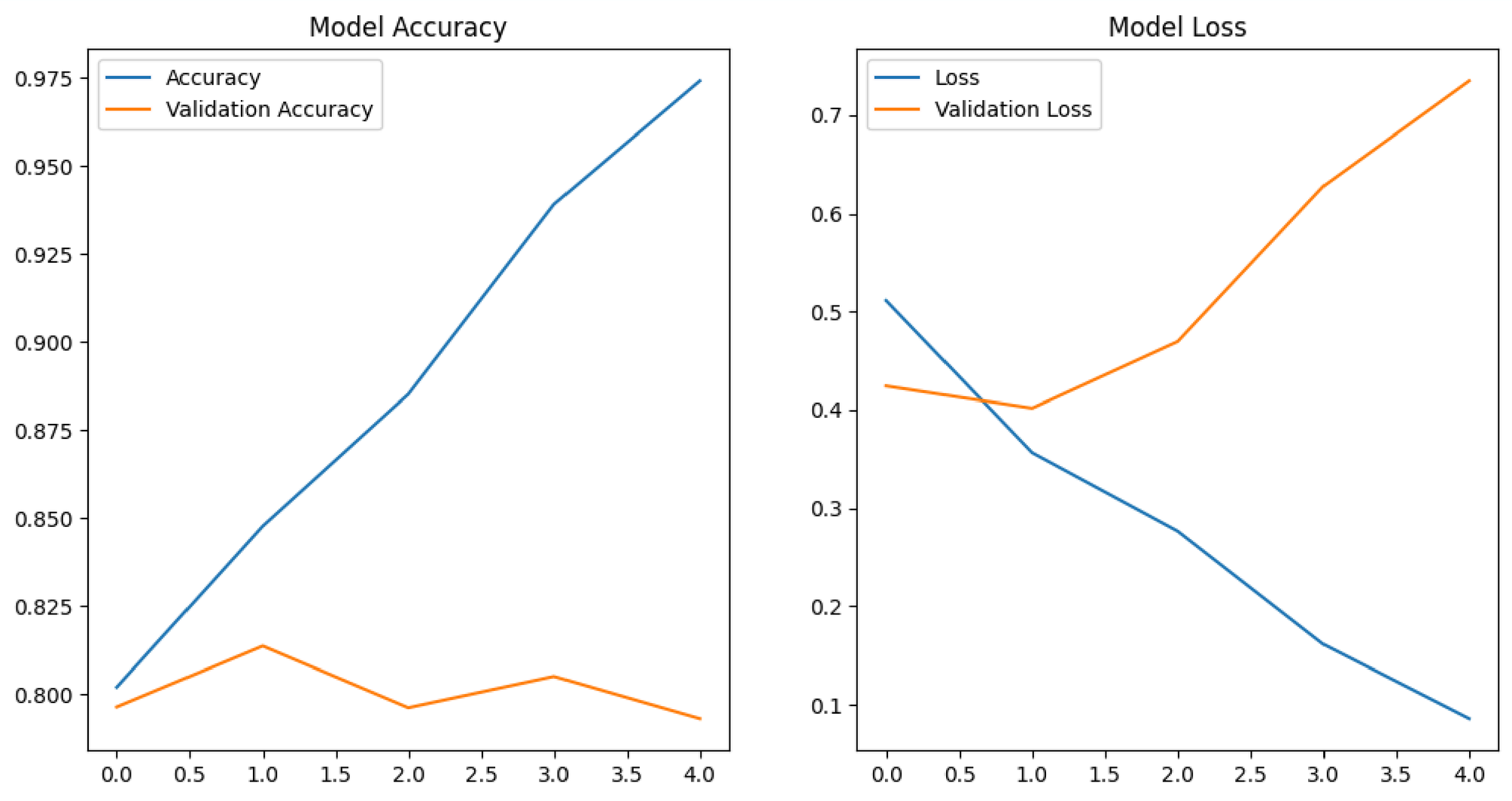
- simple model:
  - 2 hidden layers
  - optimizer "adam"
  - batch_size = 256



CNN EVALUATE

- Accuracy: 44.41%
- Precision: 44.92%
- Recall: 62.30%
- F1-Score: 52.00%

CNN EVALUATE..



CNN EVALUATE

THIS IMAGE -> RECYCLABLE

THIS IMAGE -> RECYCLABLE

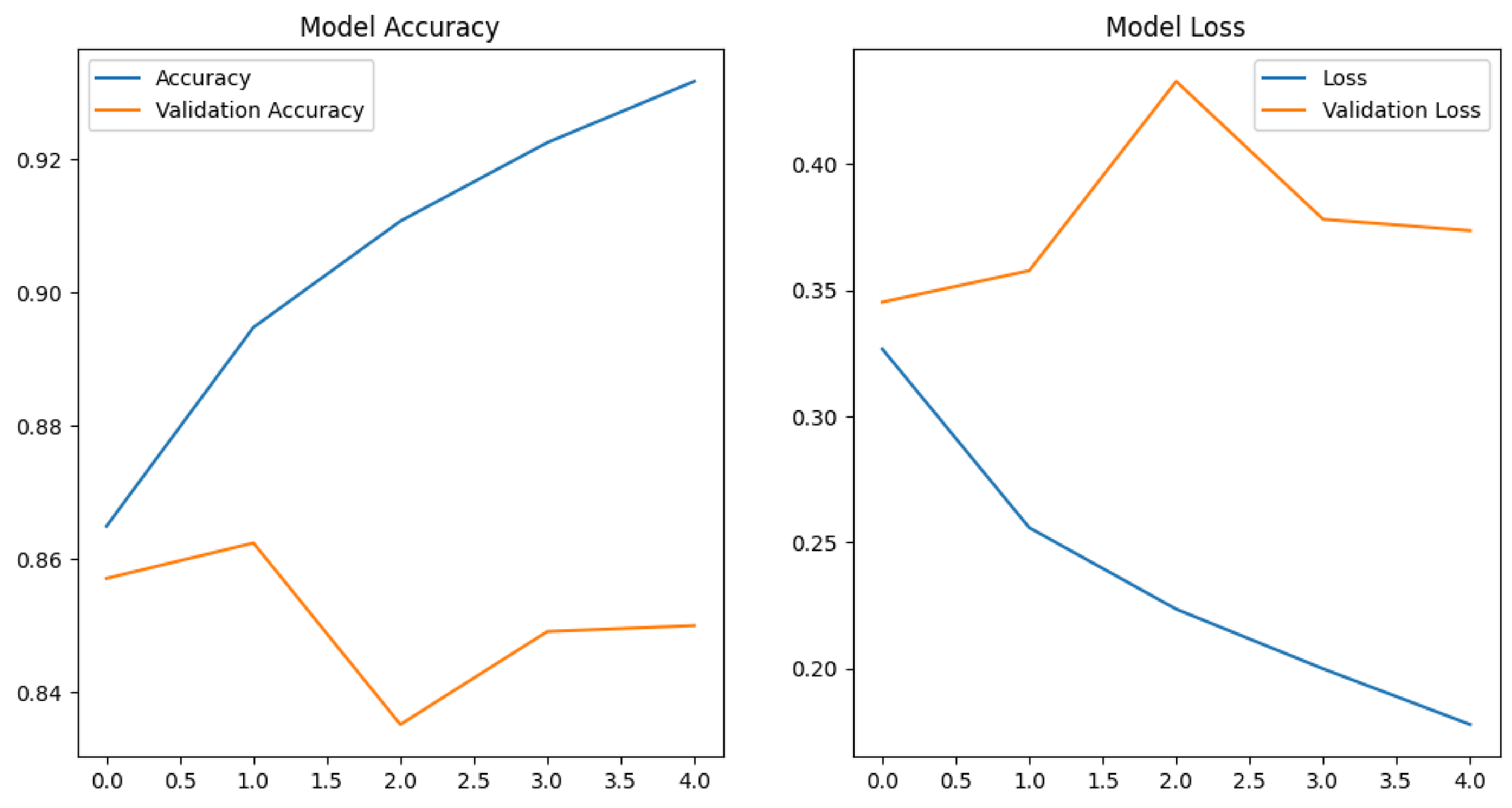
VGG16 MODEL

- simple model:
  - 1 hidden layer
  - 1 Flatten layer
  - optimizer "rmsprop"

VGG16 EVALUATE

- Accuracy: 85.00%
- Precision: 84.77%
- Recall: 85.75%
- F1-Score: 85.26%

VGG16 EVALUATE



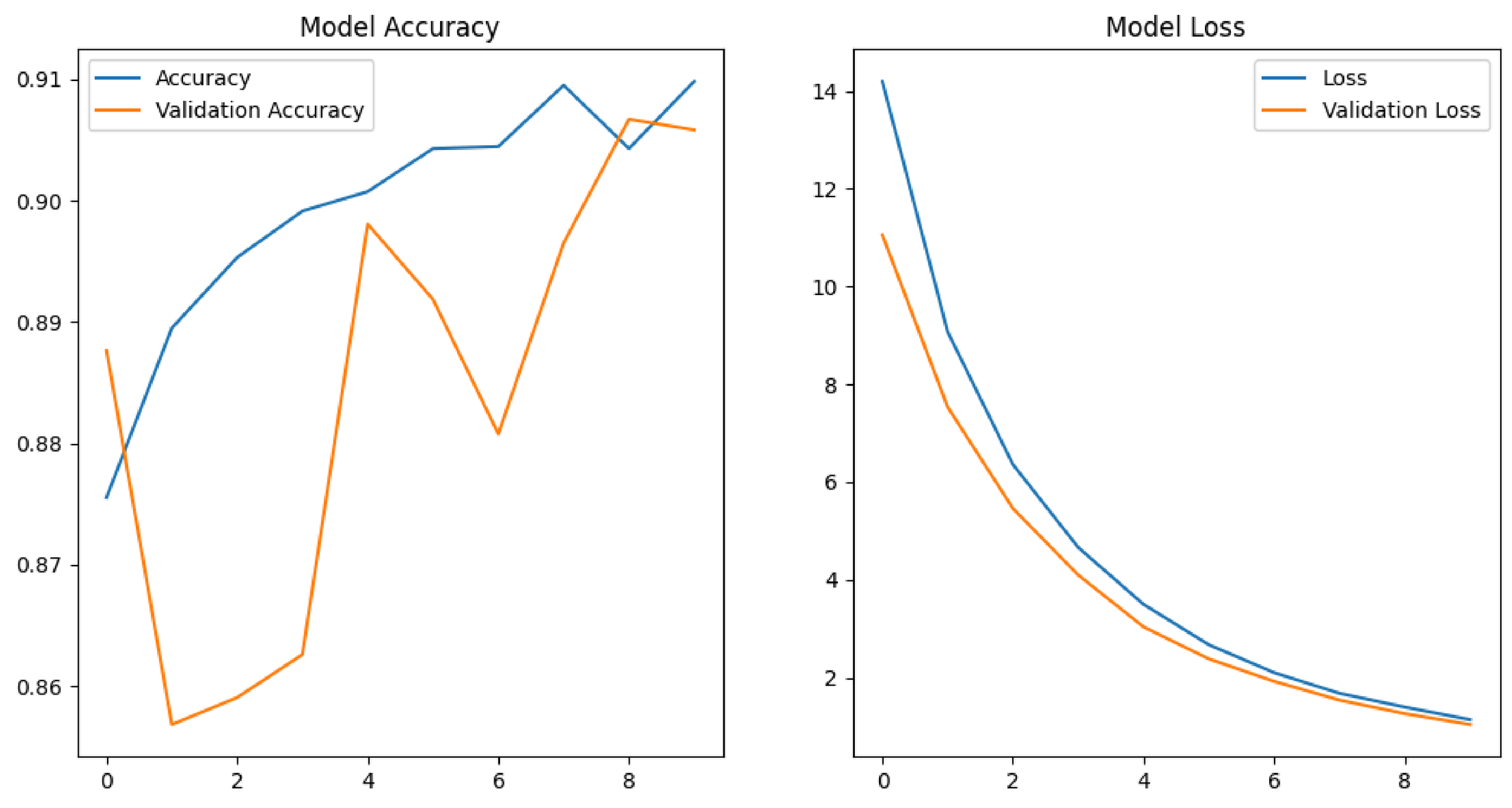
VGG16 MODEL

- **Fine-tuning and Hyperparameter Tuning:**
  - 3 hidden layers
  - 1 Flatten layer
  - BatchNormalization
  - Dropout= 0.2
  - kernel_initializer = “he_uniform”
  - Optimizer = "adam"
  - Learning_rate = 0.0001
  - Earlystopping
  - Trainable = “True”

VGG16 EVALUATE

- Accuracy: 90.47%
- Precision: 85.77%
- Recall: 94.10%
- F1-Score: 89.74%

VGG16 EVALUATE

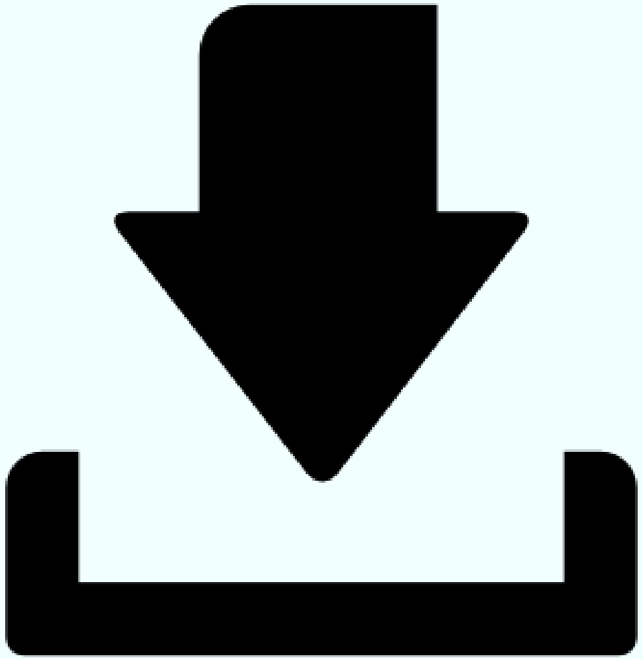


VGG16 EVALUATE

THIS IMAGE -> RECYCLABLE

THIS IMAGE -> ORGANIC

LET'S EVALUATE MODEL



CONCLUSION

CHALLENGES

HANDLING LARGE DATASETS, LONG TRAINING TIMES, AND EFFECTIVE TUNING OF HYPERPARAMETERS POSED **SIGNIFICANT CHALLENGES**.

LESSONS LEARNED

- The **importance of effective data preprocessing** and augmentation was highlighted as crucial for improving model accuracy.
- The **use of transfer learning with VGG16** proved beneficial due to pre-learned features suitable for image classification tasks.

THANK YOU

ANY QUESTION?