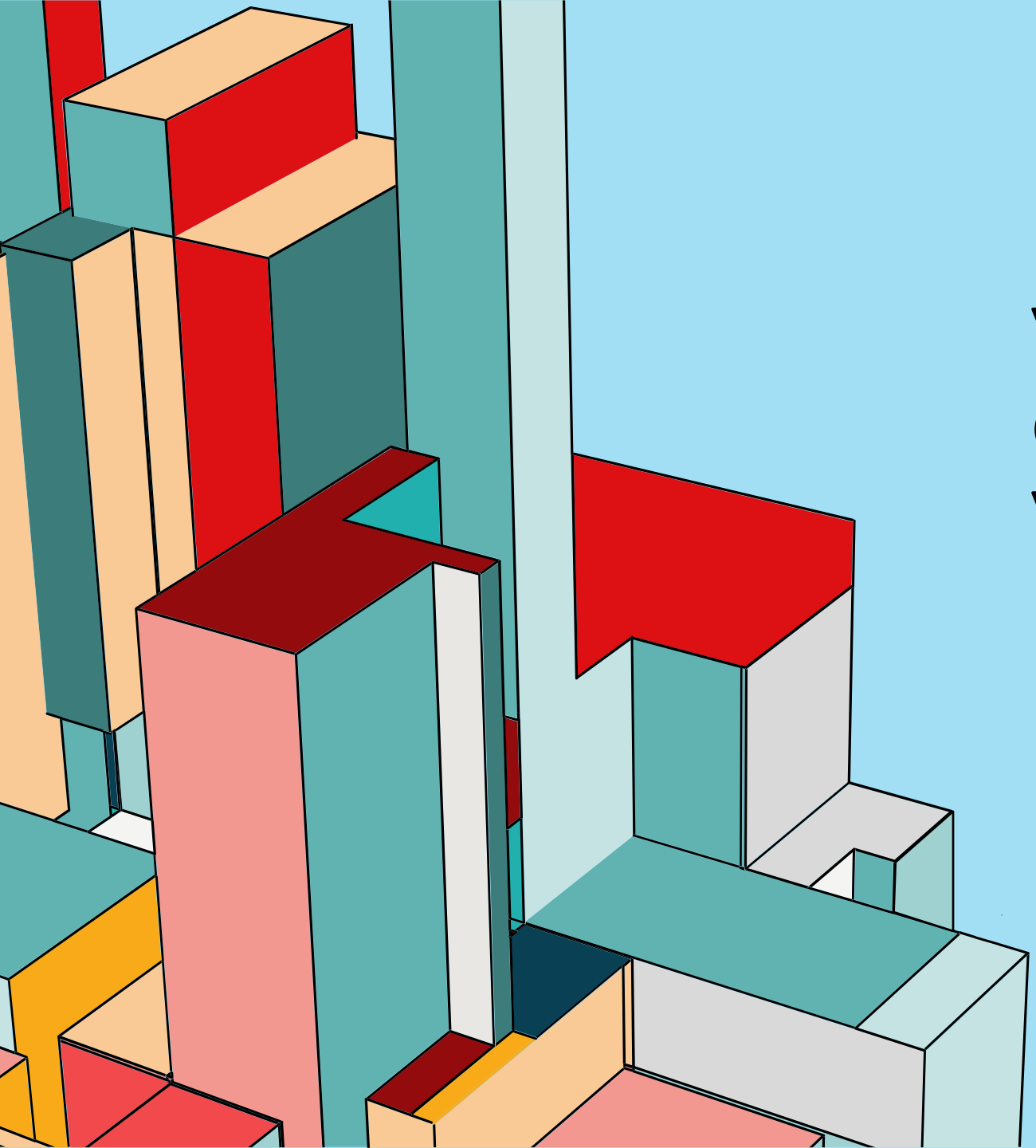


WASTE CLASSIFICATION WITH MOBILENETV2

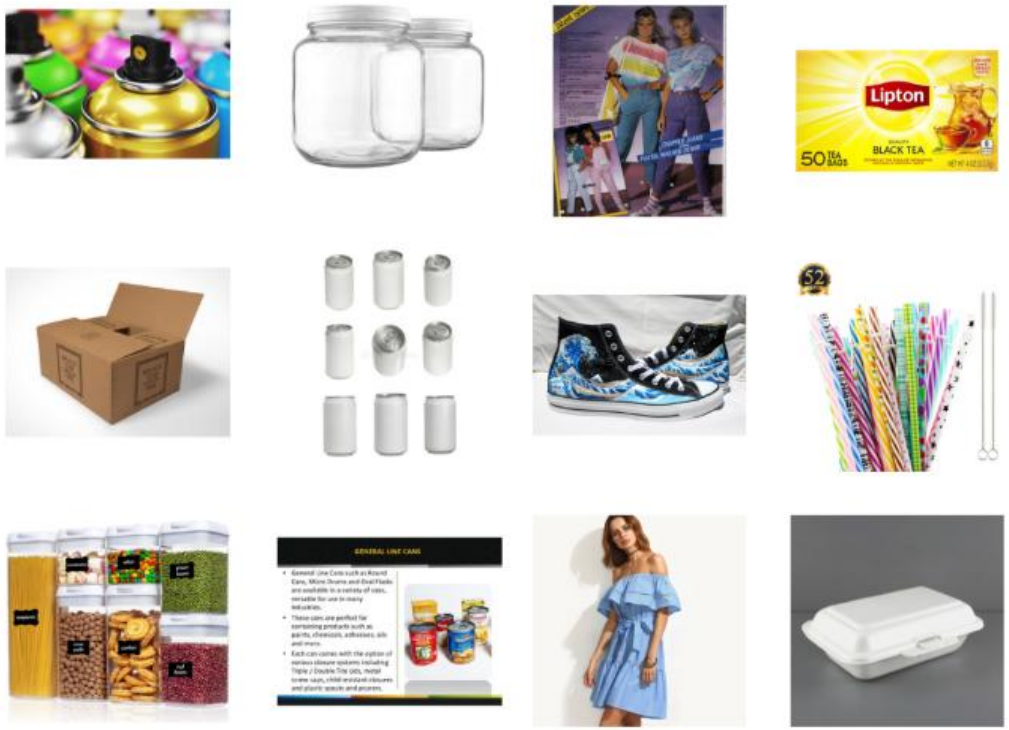
Ana
Morais

PROJECT OVERVIEW

Objective: Automate waste sorting by classifying images into "Recyclable" and "Household Waste."

Key Learning Goals:

- Understand dataset preparation and EDA for CV
- Implement Transfer Learning with MobileNetV2
- Deploy the model using Streamlit



DATASET AND EDA

- Dataset:
  - Original dataset was unorganized and required significant restructuring.
  - Images divided into two categories: **Recyclable** and **Household Waste**.
  - Dataset split: **70% Training**, **15% Validation**, **15% Test**.
- Categorization examples:
  - Plastic Shopping Bags, clothing, and tea bags as Household Waste
  - Aluminum cans, glass jars and cardboard as Recyclable
- Custom utility functions to:
  - Assign unique names to images
  - Sort images into respective categories
  - Check for corrupted files and unique image formats
  - Check data distribution across categories

```
Training Distribution: {'householdwaste': 4900, 'recyclable': 5600}
Validation Distribution: {'householdwaste': 1050, 'recyclable': 1200}
Test Distribution: {'householdwaste': 1050, 'recyclable': 1200}
```

IMPLEMENTATION DETAILS

Model Training Pipeline:

- tf prefetch() for efficient data loading
- Early stopping monitoring validation loss
- Learning Rate Scheduling with exponential decay for dynamic learning rate

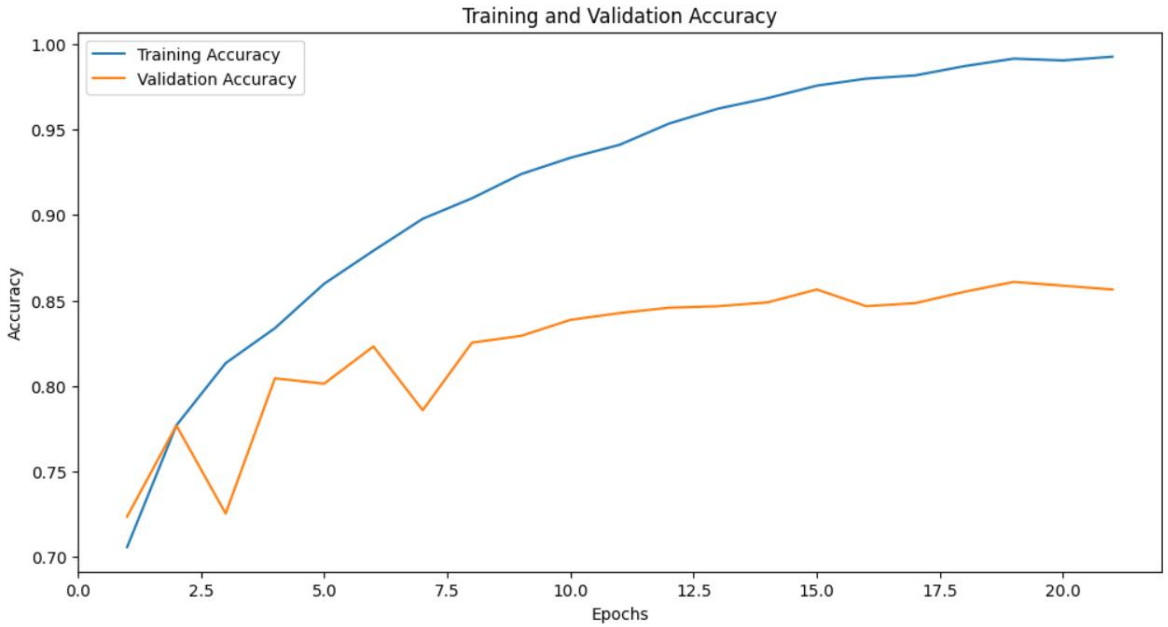
Model: MobileNetV2:

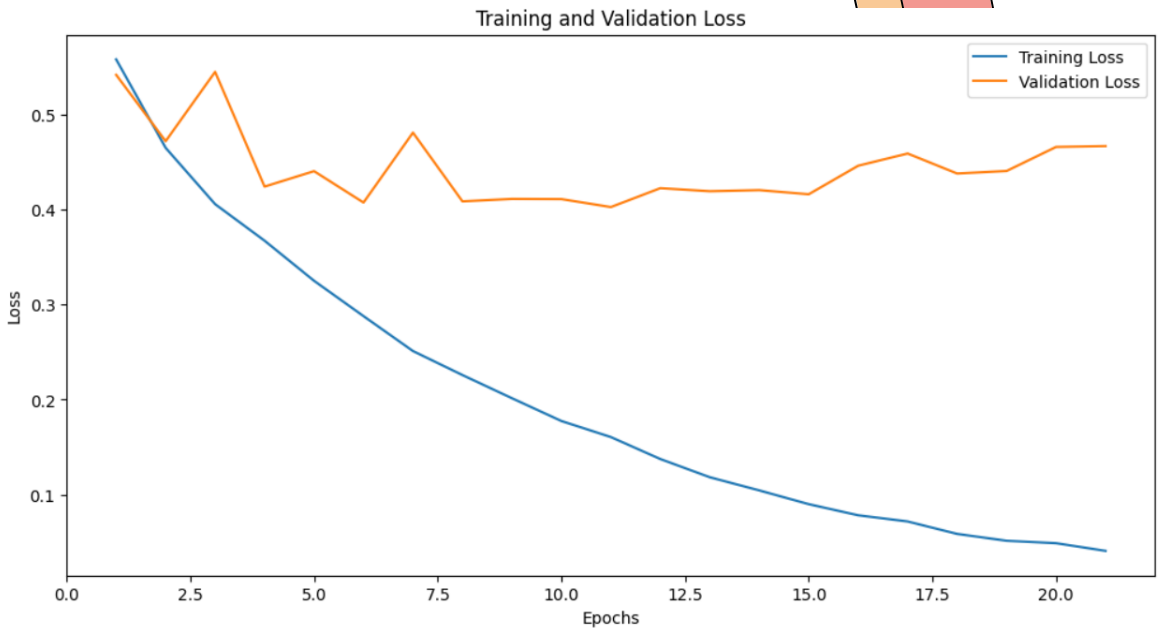
- Pre-trained on ImageNet
- Base layers frozen
- Custom top layers for binary classification
- Compiled with Adam, Loss: Binary Crossentropy, Metric: accuracy

Model Checkpoint: Saved best-performing model based on validation loss

TRAINING RESULTS

- Training Accuracy: ~98%
- Test accuracy of ~85.5%

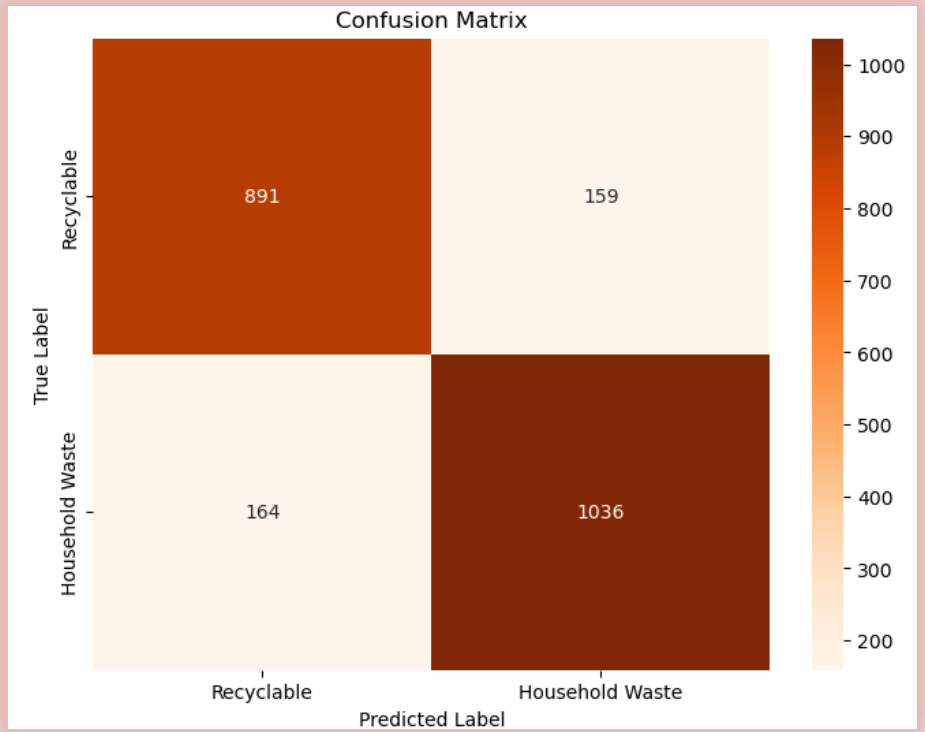




MODEL EVALUATION

Classification Report:

	precision	recall	f1-score	support
Recyclable	0.84	0.85	0.85	1050
Household Waste	0.87	0.86	0.87	1200
accuracy			0.86	2250
macro avg	0.86	0.86	0.86	2250
weighted avg	0.86	0.86	0.86	2250



True: Household Waste
Pred: Household Waste

True: Recyclable
Pred: Recyclable

True: Recyclable
Pred: Household Waste

True: Recyclable
Pred: Household Waste

True: Household Waste
Pred: Household Waste

True: Household Waste
Pred: Household Waste

True: Recyclable
Pred: Recyclable

True: Household Waste
Pred: Recyclable

True: Recyclable
Pred: Recyclable

FINAL TIPS & TAKEAWAYS

Did we meet the Goals?

Achieved an automated waste classification system

~85% test accuracy

Preprocessing is key!

Transfer learning saves time and improves performance

Next Steps:

- Model Optimization:
  - Dropout layers
  - Augmentation (more?)
  - Fine-tuning
- Data Expansion:
  - Incorporate more waste categories and diverse images
  - Deeper exploration of the initial set of images

<u>Incorporate distinction between product and package!</u>

THANK YOU