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Boost Recycling Rate with



Define Problem

2022 UK Recycling Rate: 44.1%

2022 Arisings 25,691

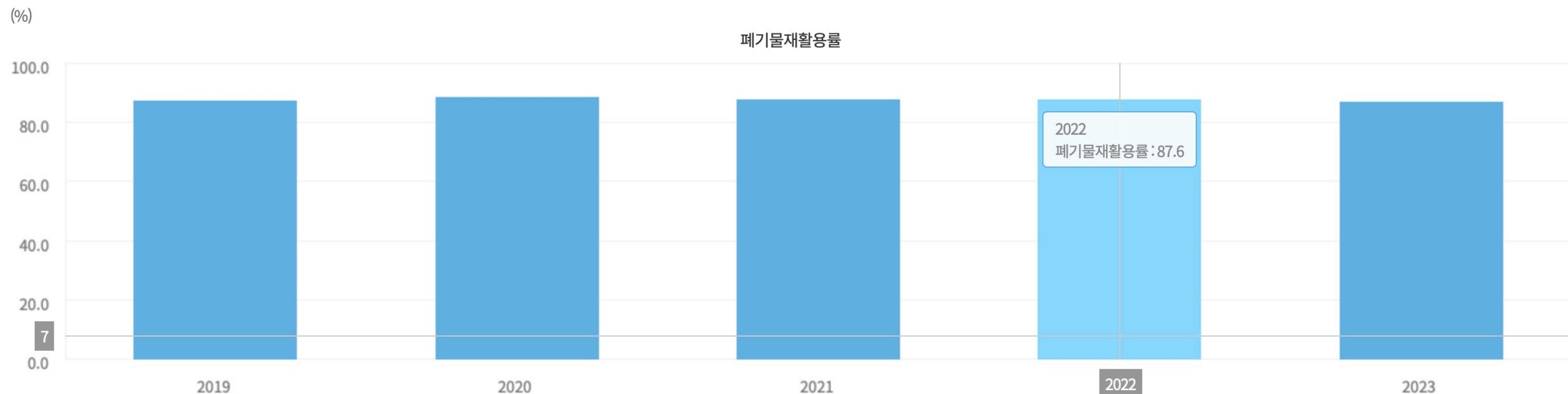
Of which
recycled 11,330

Recycling rate **44.1%**



<https://renewableenergyfollowers.tistory.com>

2022 South Korea Recycling Rate: 87.6%



Create a model that automatically classifies wastes by type (AI-based waste classification system)



Our project goal

“A service that makes it easy to identify recycling types”

Let's make it easy to identify waste types with just one photo!

How can I make it easier to sort garbage?



Make AI!



Let's boost the UK's recycling rate by making waste separation easier!

Formalizing Problem Using Machine Learning



Input
Trash photos taken by users



ML model
Garbage is classified into "paper", "plastic", "metal" etc
Use the Azure analyze image learned in day3 part 2



Output
It analyzes the types of garbage and tells you

Then, what dataset do we need?

Photo of Various Kinds of Garbage - TrashNet Dataset

trashnet

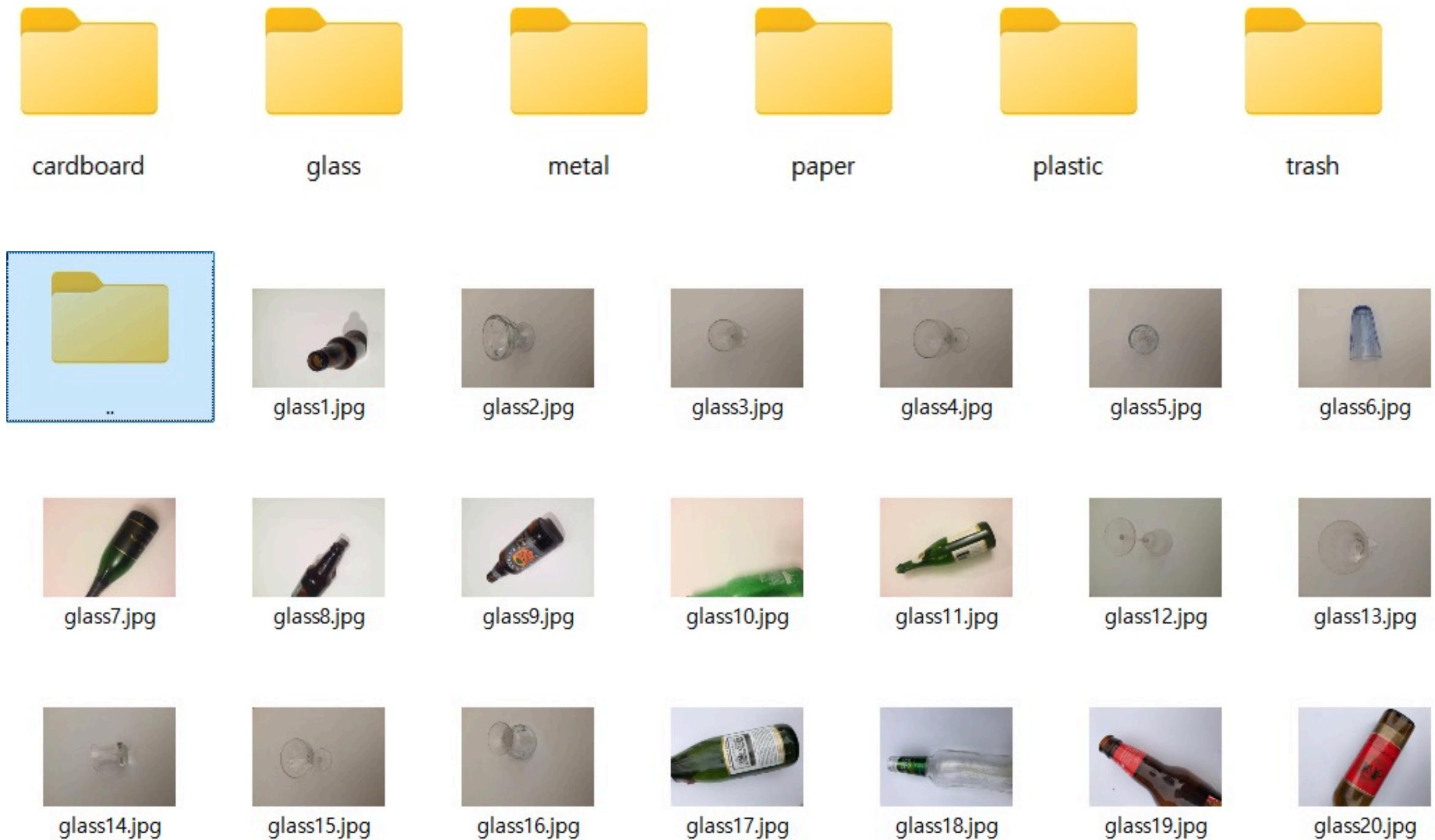
Code (only for the convolutional neural network) and dataset for mine and [Mindy Yang's](#) final project for [Stanford's CS 229: Machine Learning class](#). Our paper can be found [here](#). The convolutional neural network results on the poster are dated since we continued working after the end of the quarter and were able to achieve around 75% test accuracy (with 70/13/17 train/val/test split) after changing the weight initialization to the Kaiming method.

Dataset

This repository contains the dataset that we collected. The dataset spans six classes: glass, paper, cardboard, plastic, metal, and trash. Currently, the dataset consists of 2527 images:

- 501 glass
- 594 paper
- 403 cardboard
- 482 plastic
- 410 metal
- 137 trash

The pictures were taken by placing the object on a white posterboard and using sunlight and/or room lighting. The pictures have been resized down to 512 x 384, which can be changed in `data/constants.py` (resizing them involves going through step 1 in usage). The devices used were Apple iPhone 7 Plus, Apple iPhone 5S, and Apple iPhone SE.



find and process suitable datasets

Dataset to use

📦 cardboard

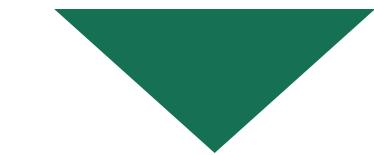
🍷 glass

🥤 metal

🥤 plastic

📖 paper

🚫 trash



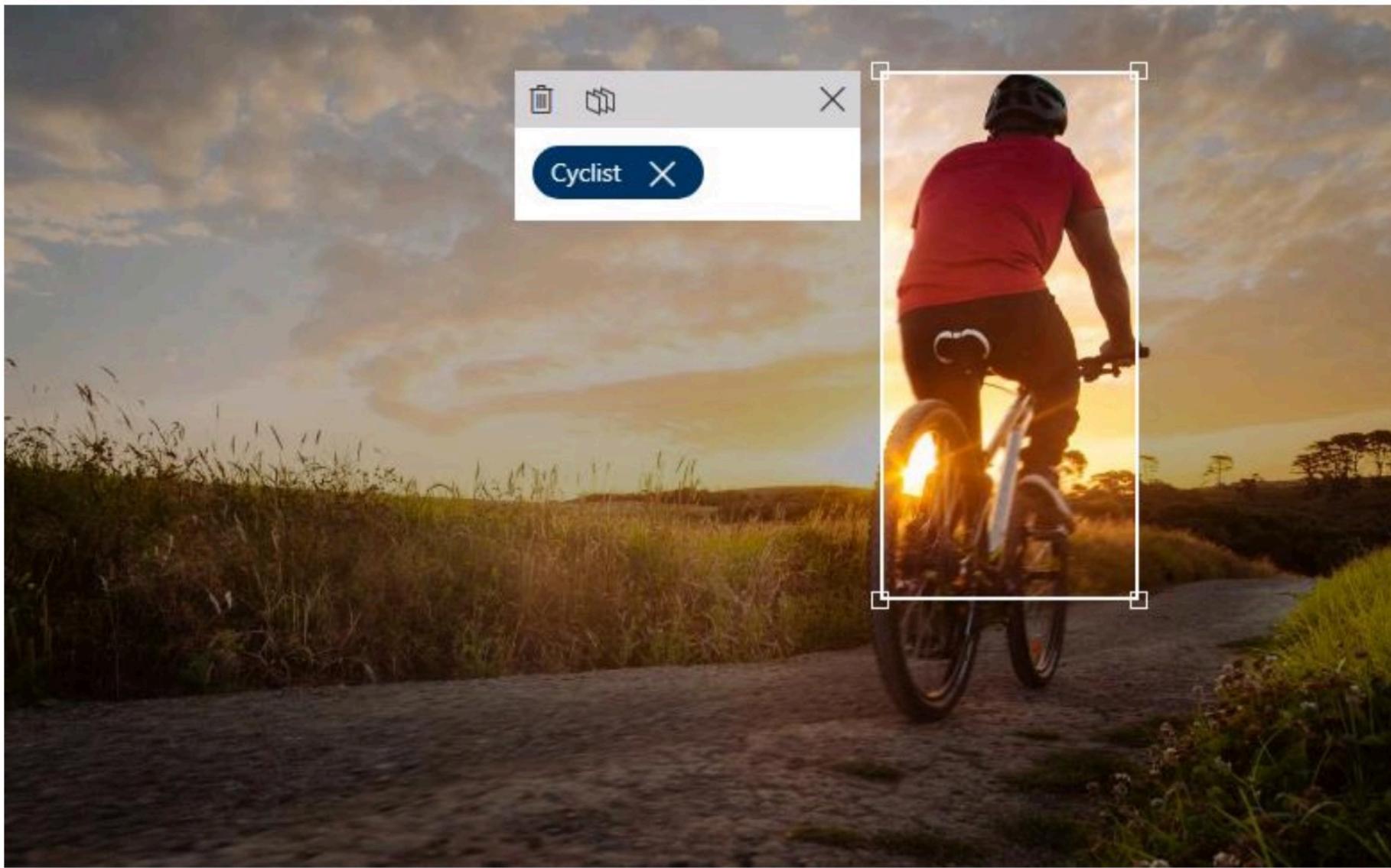
As a result,
Bring 20 pictures of each type of garbage,
Analyzing a total of 120 photos

find and process suitable datasets

Take a picture of one product and enter it

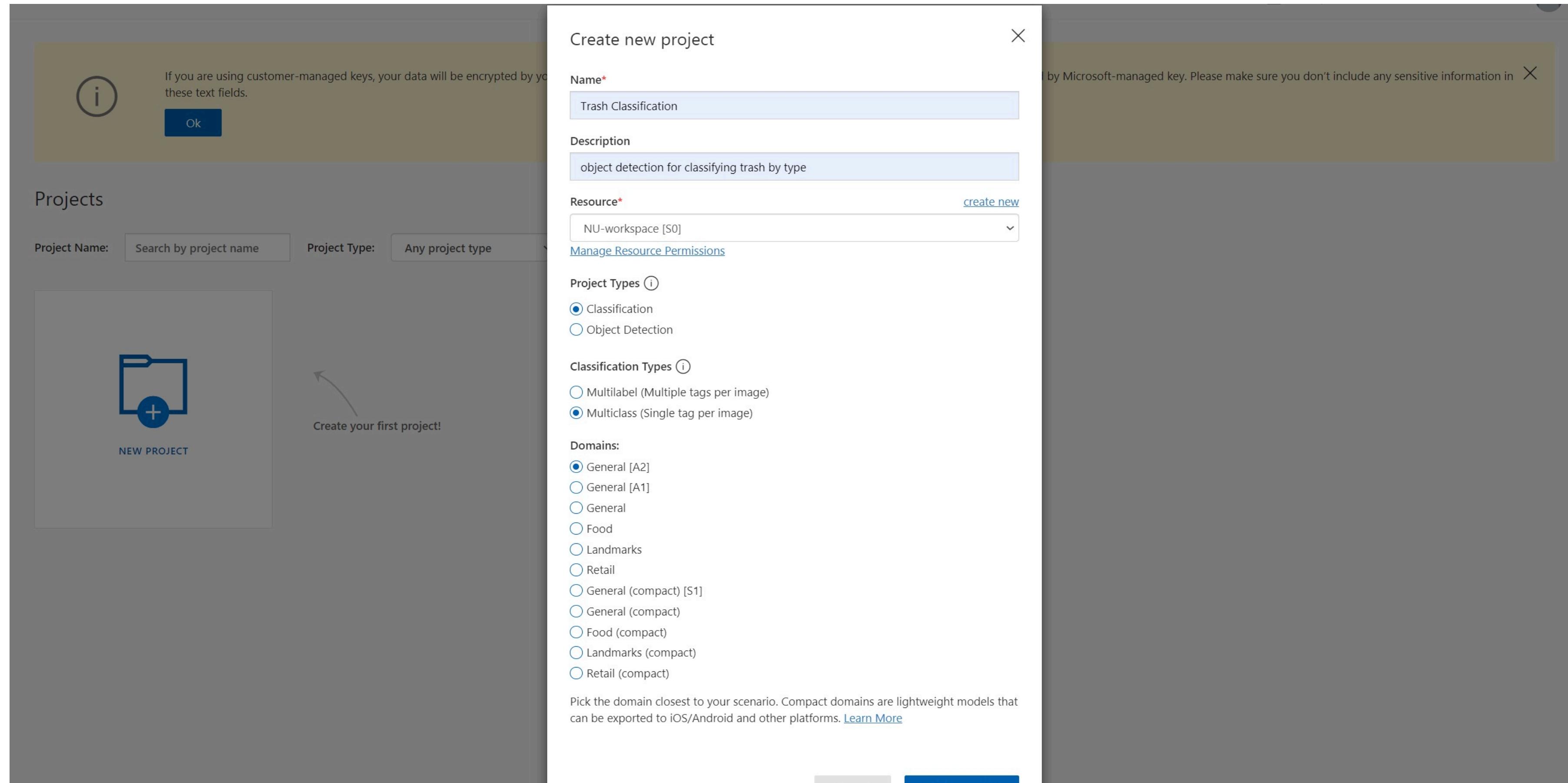


Need an accurate analysis of one object



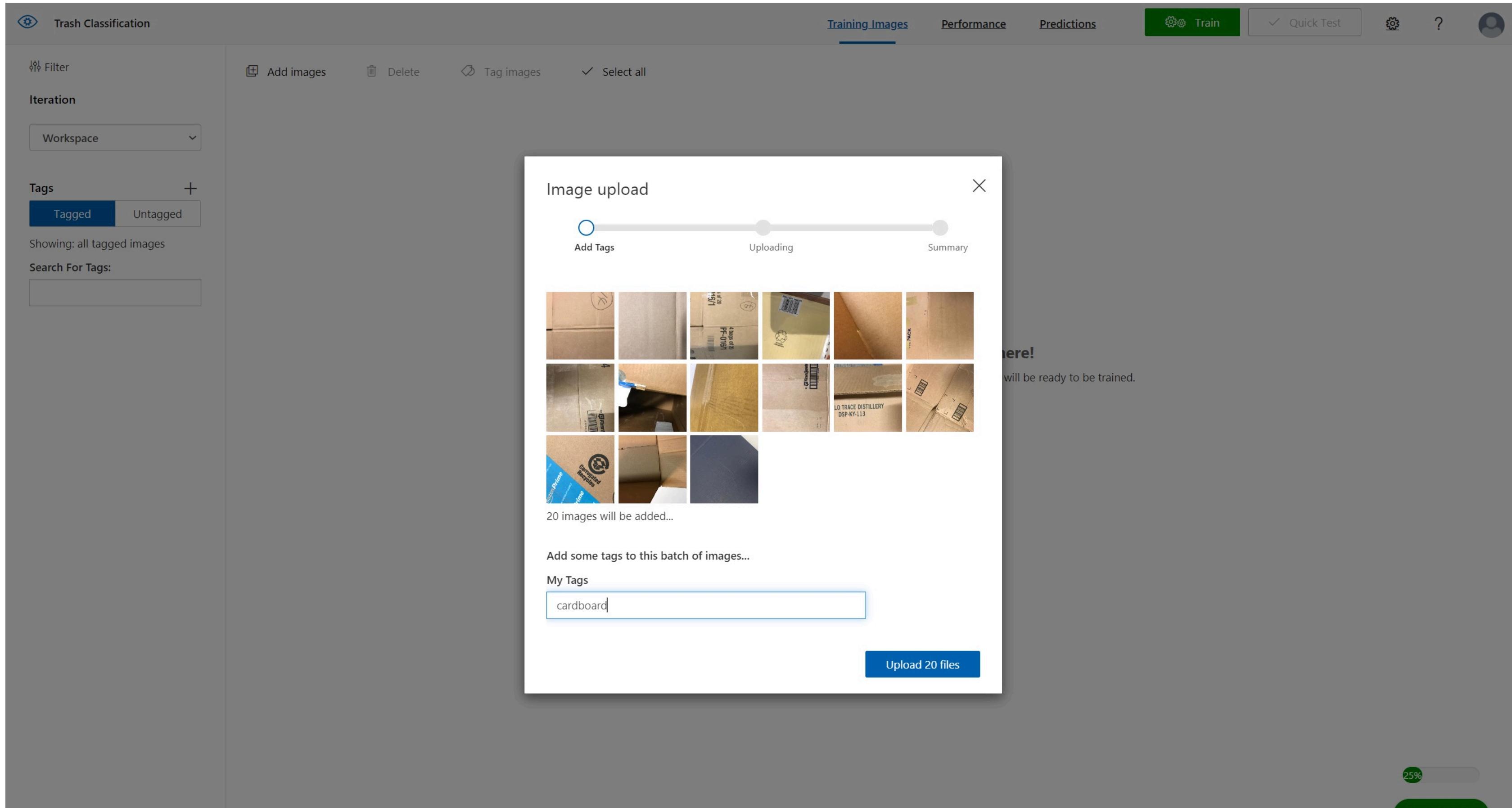
Decided to use

Custom Vision portal



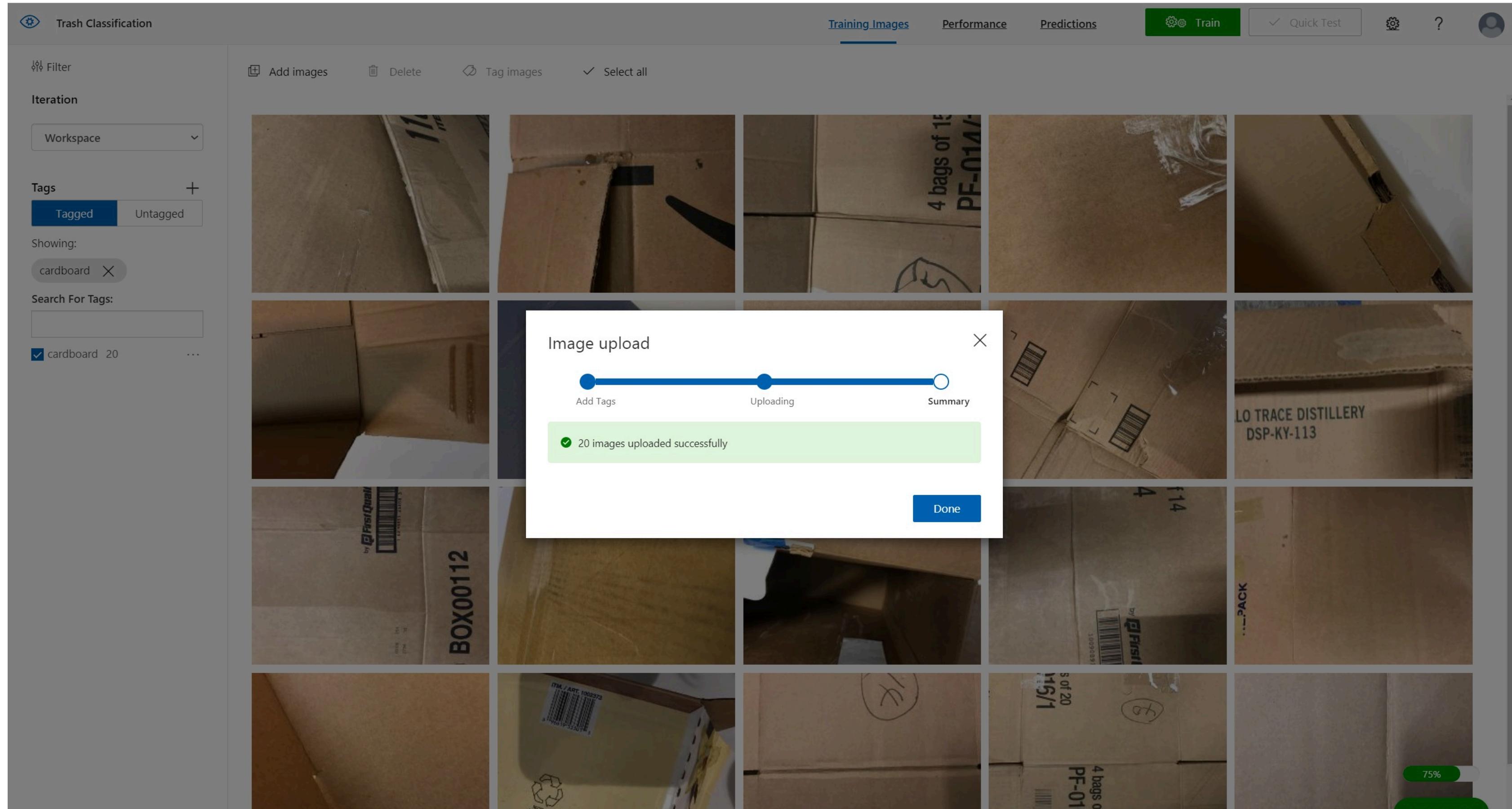
Create Trash Classification AI Project Service in Azure

Implement Solutions on Azure



Upload Dataset we prepared

Implement Solutions on Azure



We trained the dataset we prepared.

Implement Solutions on Azure

Training Images

Iteration: Workspace

Tags: Tagged (selected), Untagged

Showing: all tagged images

Search For Tags:

- cardboard 20
- glass 20
- metal 20
- paper 20
- plastic 20
- trash 20

Get started

Training Images

Iteration: Workspace

Tags: Tagged (selected), Untagged

Showing: all tagged images

Search For Tags:

- cardboard 20
- glass 20
- metal 20
- paper 20
- plastic 20
- trash 20

Get started

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- plastic 20
- trash 20

Get started

Outcome

Image Detail

X



My Tags

Add a tag and press enter

Predictions

Tag	Probability
metal	92.7%
plastic	4.7%
glass	1.1%
paper	0.8%
cardboard	0.3%

Save and close

Test Result of our AI model

Outcome

Image Detail



My Tags
Add a tag and press enter

Predictions

Tag	Probability
plastic	95.5%
glass	2.8%
metal	0.6%
trash	0.4%
paper	0.3%

Save and close

X

Image Detail



My Tags
Add a tag and press enter

Predictions

Tag	Probability
cardboard	97.5%
trash	1.7%
paper	0.6%
metal	0%
plastic	0%

Save and close

X

Image Detail



My Tags
Add a tag and press enter

Predictions

Tag	Probability
trash	98.2%
metal	1.3%
paper	0.1%
cardboard	0.1%
plastic	0%

Save and close

X

Image Detail



My Tags
Add a tag and press enter

Predictions

Tag	Probability
glass	99.3%
plastic	0.4%
metal	0.1%
paper	0%
cardboard	0%

Save and close

X

Image Detail



My Tags
Add a tag and press enter

Predictions

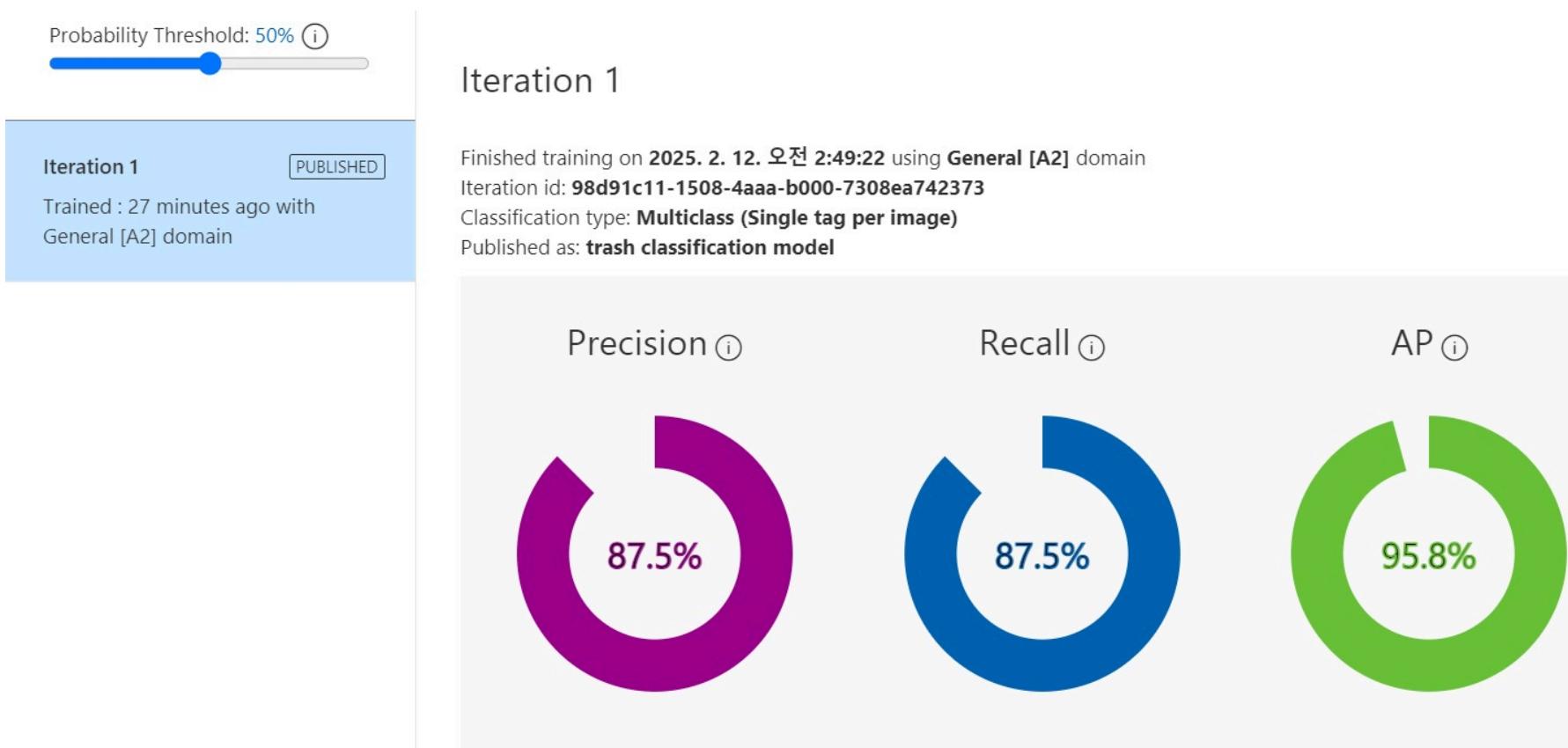
Tag	Probability
paper	99.2%
trash	0.4%
cardboard	0.1%
plastic	0%
glass	0%

Save and close

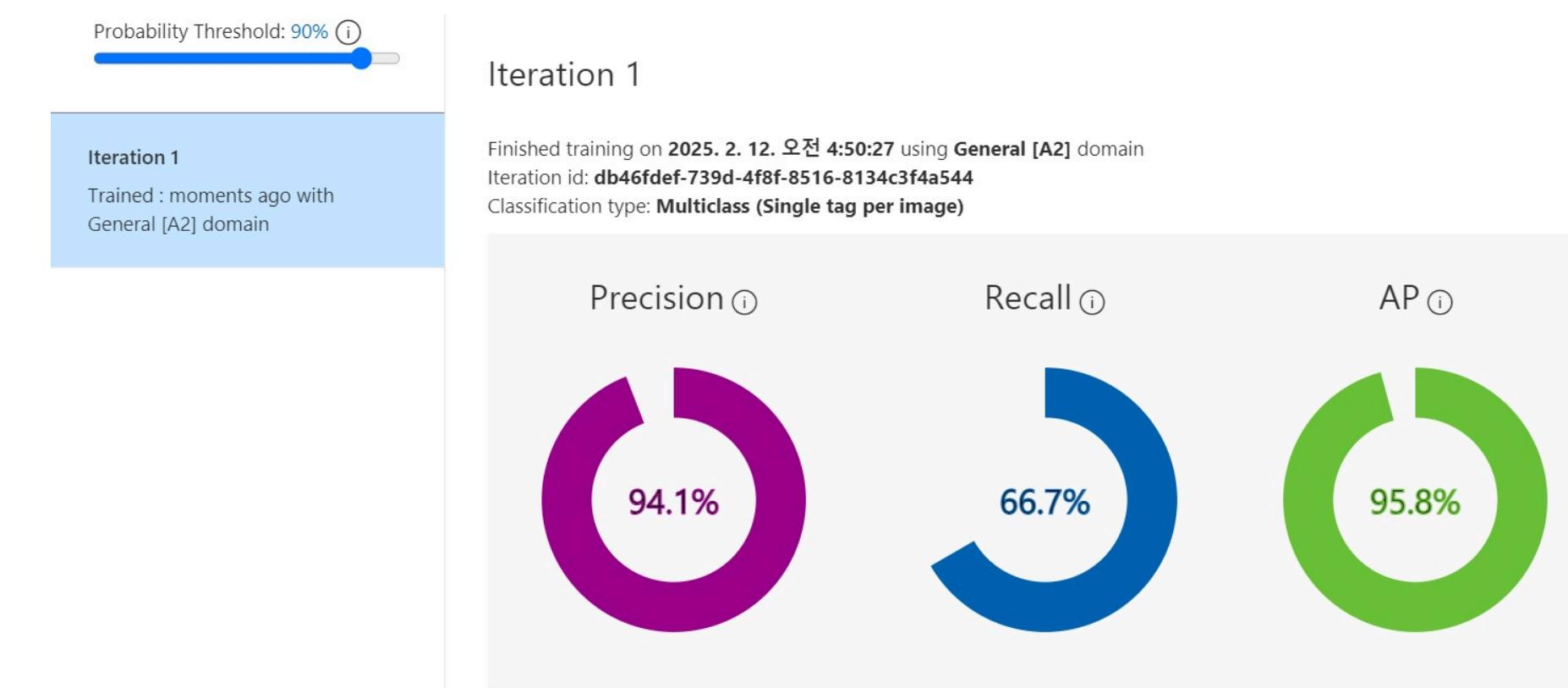
Extra Test

Model Performance

Threshold 50%



Threshold 90%



Performance Per Tag

Performance Per Tag

Limitations

Classification accuracy
of plastic and glass



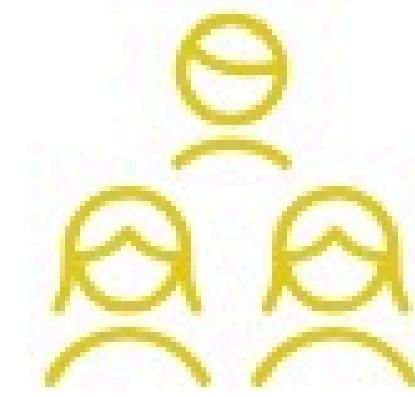
How to improve it

1. Collecting additional data
2. Applying advanced models
to analyze detailed features

Our service name is
“Binny Buddy”



STP strategy



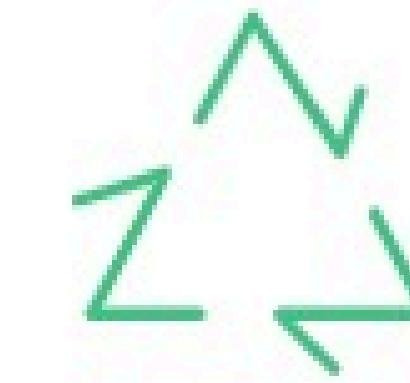
Segmentation

- Users unfamiliar with recycling
- Eco-conscious users in the UK



Targeting

- Individuals aiming to form eco-friendly habits



Positioning

- Easy and accurate recycling service

Our project goal

Marketing Strategy

Partnerships

Building credibility through strategic collaborations



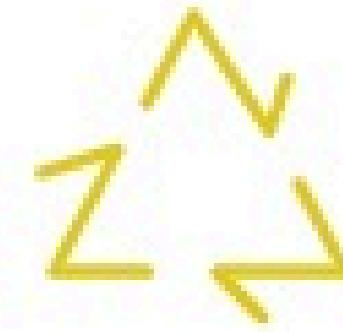
Eco-friendly Messages

Highlighting sustainability and environmental protection.

Social Media Campaign

Use QR codes to engage online campaigns.

Expected Outcomes



Recycling Rate

Improving waste sorting accuracy to enhance recycling.



Cost Reduction

Saving on waste management expenses for organizations.

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Thank you

