CanOrNot?

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PROBLEM

The average global recycling rate is at a low of **19%**.

Why?

1. **Lack of public awareness** of what can be recycled
    a. Contamination of items in blue bins of SG
    b. Different countries, different recycling rules
2. **Landscape of recycling**
    a. Majority are disposed of as general waste rather than recycled through a circular value chain.
3. **Increased Consumerism**
    a. Sophisticated packaging makes it harder for people to recycle

EXISTING WORKS

1. Classification of recycling logos on tetra packs

- Only 2 classes - *CPAP81, CPAP84*
- Limited to only paper carton

2. Waste detection in natural and urban environments

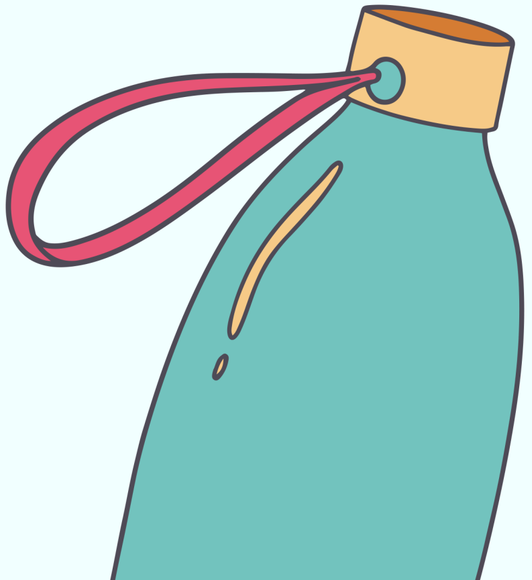
- Post-consumer solution
- Classfies: bio, glass, metal and plastic, non-recyclable, other, paper, and unknown

OUR SOLUTION

Take a photo and the object will be classified into 6 categories:

Cardboard | Paper | Metal | Plastic | Glass | Trash

More information can be given on what material and how it can be recycled!



WHO WILL THIS AFFECT?

We will be targeting citizens in countries who have difficulty trying to segregate waste.

Nonetheless, anyone can still use this for their benefit!

OBJECTIVE:

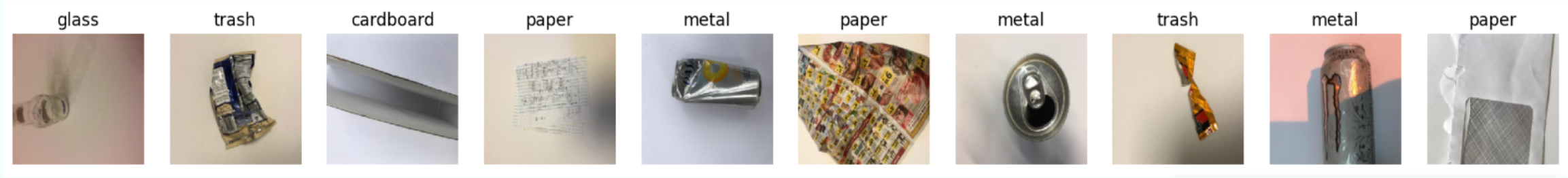
- Develop a highly accurate ML model that can classify waste materials into their respective recycling categories.
- Promote recycling and environmental sustainability by leveraging technology to enhance waste management practices.

DATASETS

Garbage Classification

- Images with ***6 classes*** labelled: cardboard, glass, metal , paper, plastic and trash.

1. https://www.kaggle.com/datasets/asdasdasasdas/garbage-classification



2. https://github.com/garythung/trashnet

Pre-processing concerns

- Null labels
- Distorted/ unclear images
- Training data significantly reduced

Try: combine datasets / data augmentation

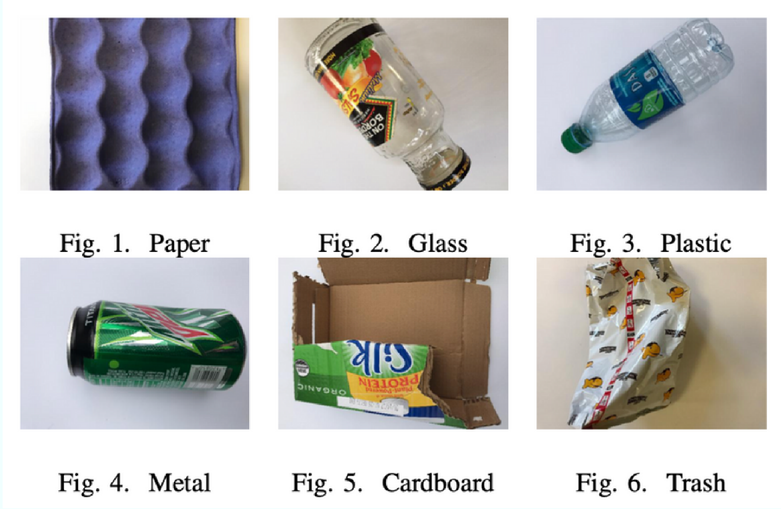


Fig. 1. Paper

Fig. 2. Glass

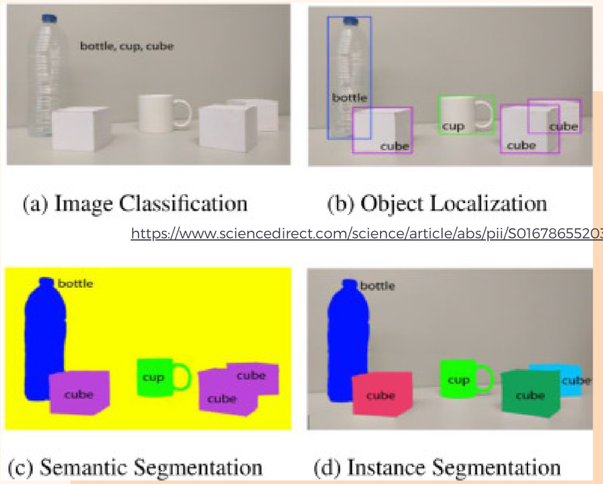
Fig. 3. Plastic

Fig. 4. Metal

Fig. 5. Cardboard

Fig. 6. Trash

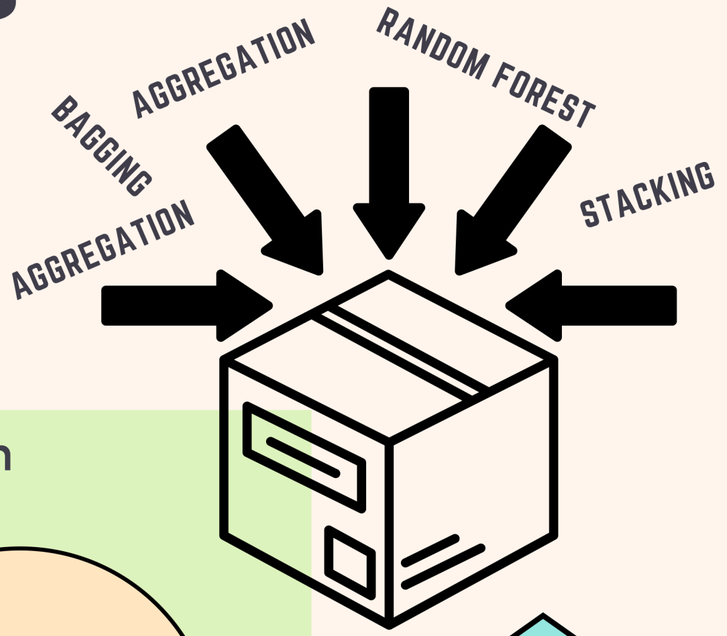
PIPELINE & MODELS



https://www.sciencedirect.com/science/article/abs/pii/S0167865520303470

Classifying multiple objects

Purely waste classification



Semantic Segmentation

- Pre-processing
- Parameter-tuning
- Post-processing

ResNet50

VGG-16

- Pre-processing
- Parameter-tuning
- Post-processing

Ensemble

- Bagging
- Boosting
- Stacking

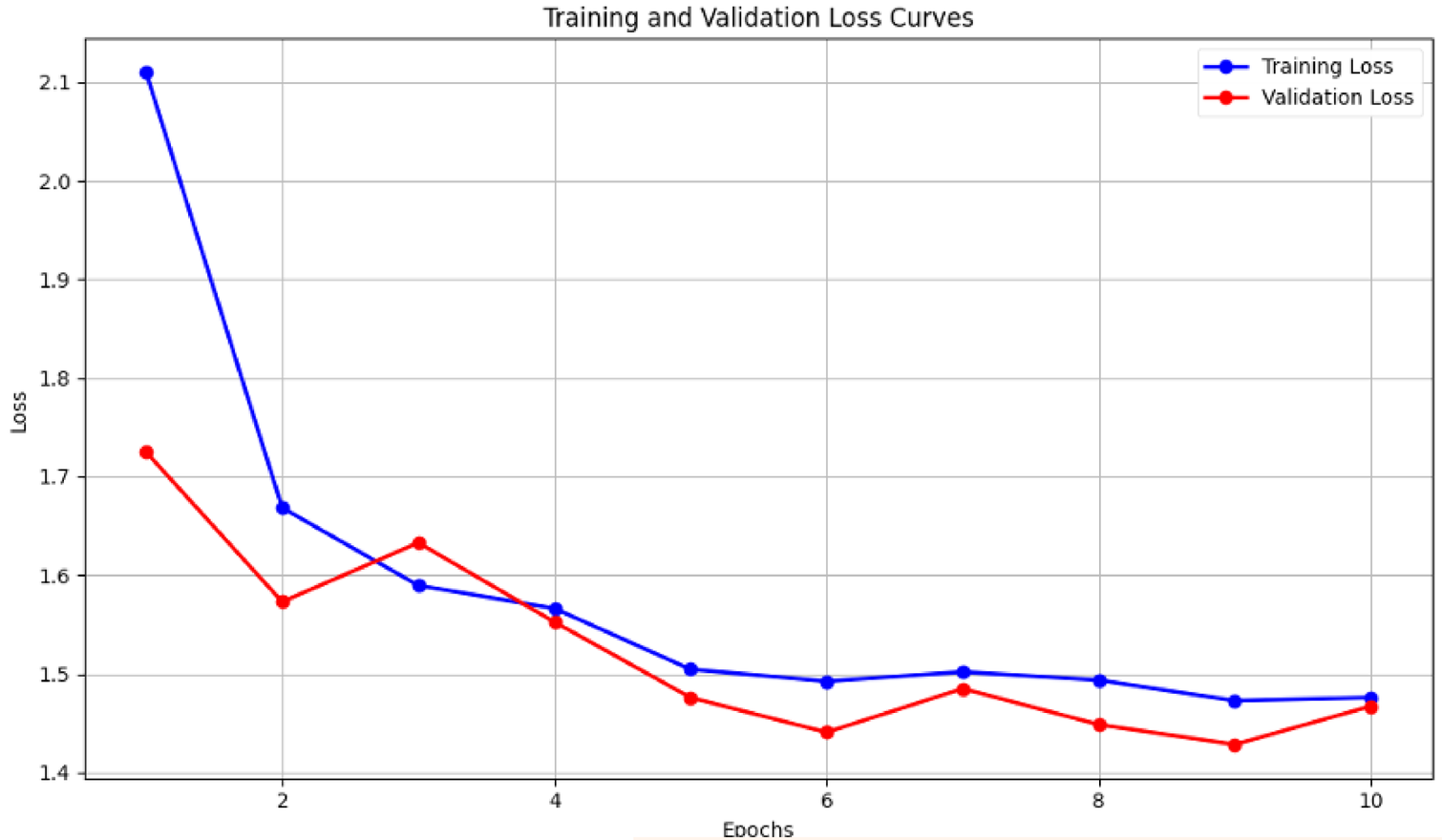
CAN OR NOT?

OPTION 1

OPTION 2

HOW WE EVALUATE

- Confusion Matrix
- F1 Score
- ROC
- Accuracy
- Validation Loss
- Validation Accuracy

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──────────────────────────────
--------] - 489s 3s/step - loss: 2.1007 - accuracy: 0.2876 - val
--------] - 490s 3s/step - loss: 1.6684 - accuracy: 0.3571 - val
--------] - 490s 3s/step - loss: 1.5896 - accuracy: 0.4018 - val
--------] - 487s 3s/step - loss: 1.5663 - accuracy: 0.3991 - val
--------] - 487s 3s/step - loss: 1.5046 - accuracy: 0.4456 - val_loss: 1.4759 - val_accuracy: 0.4333
--------] - 467s 3s/step - loss: 1.4924 - accuracy: 0.4416 - val_loss: 1.4407 - val_accuracy: 0.4667
--------] - 473s 3s/step - loss: 1.5019 - accuracy: 0.4447 - val_loss: 1.4050 - val_accuracy: 0.4950
--------] - 496s 3s/step - loss: 1.4936 - accuracy: 0.4438 - val_loss: 1.4405 - val_accuracy: 0.4950
--------] - 503s 4s/step - loss: 1.4727 - accuracy: 0.4500 - val_loss: 1.4203 - val_accuracy: 0.4917
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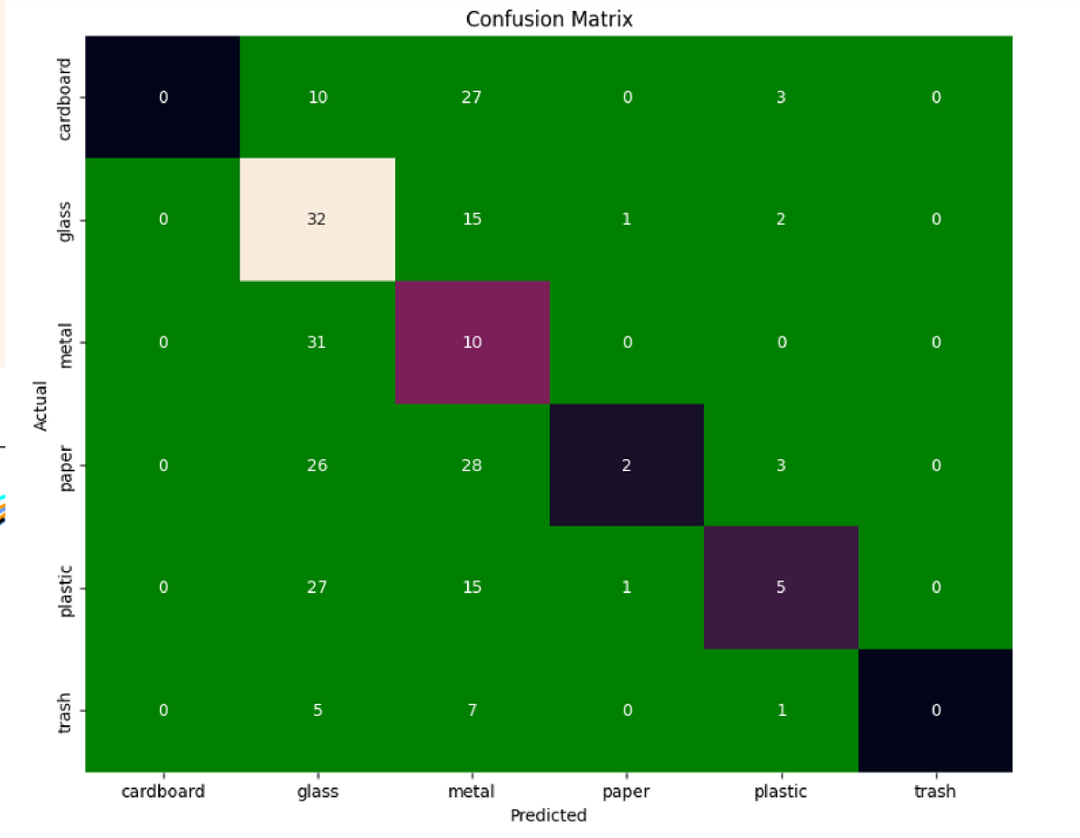
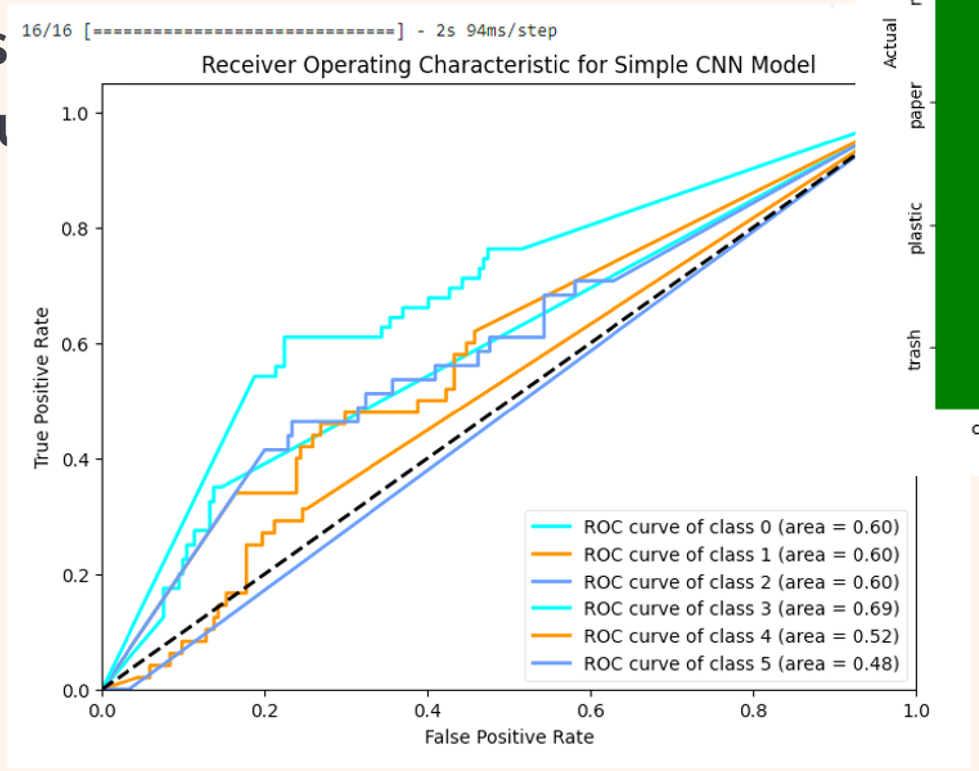
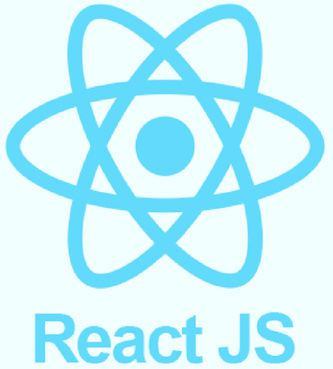
HOW WE EVALUATE

Confusion Matrix
F1 Score
ROC
Accuracy
Validation Loss
Validation Accu





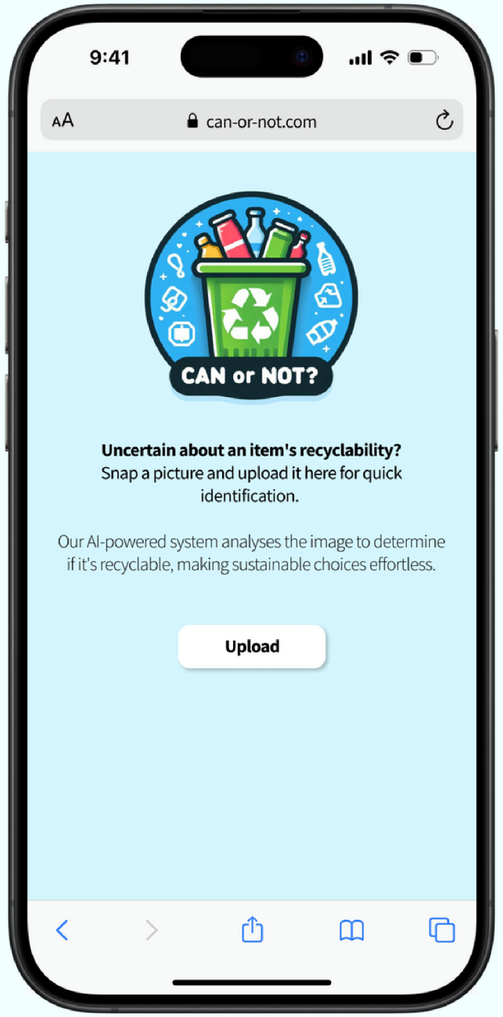
WEB APP ARCHITECTURE

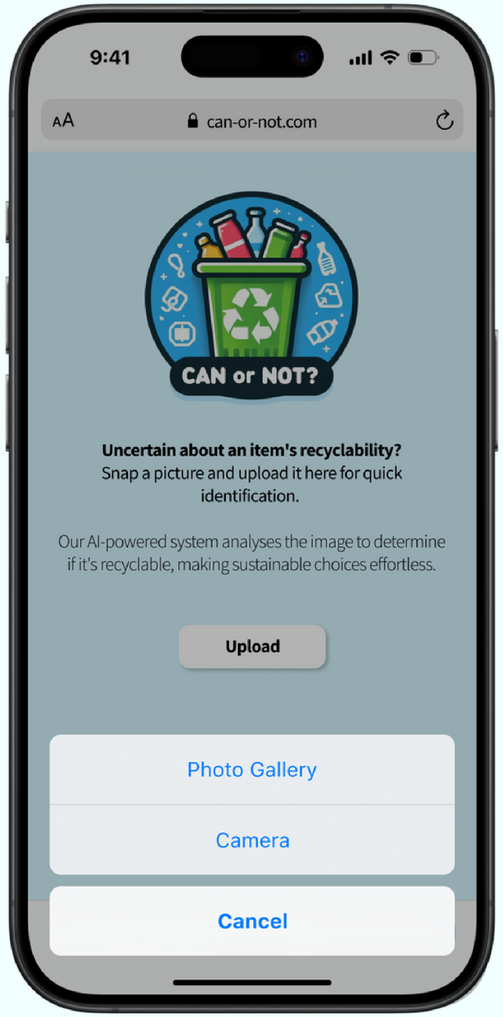


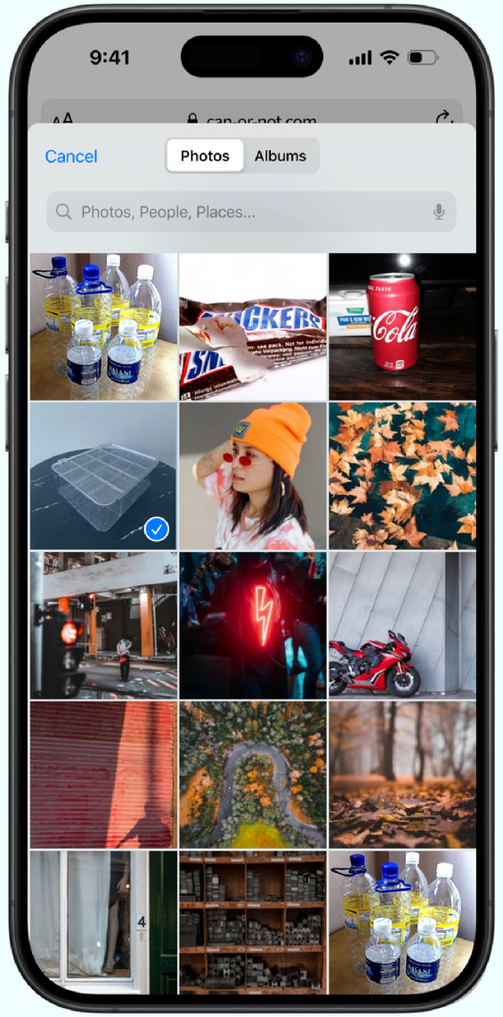
Backend

Frontend

GRAPHICAL USER INTERFACE







GRAPHICAL USER INTERFACE

Glass

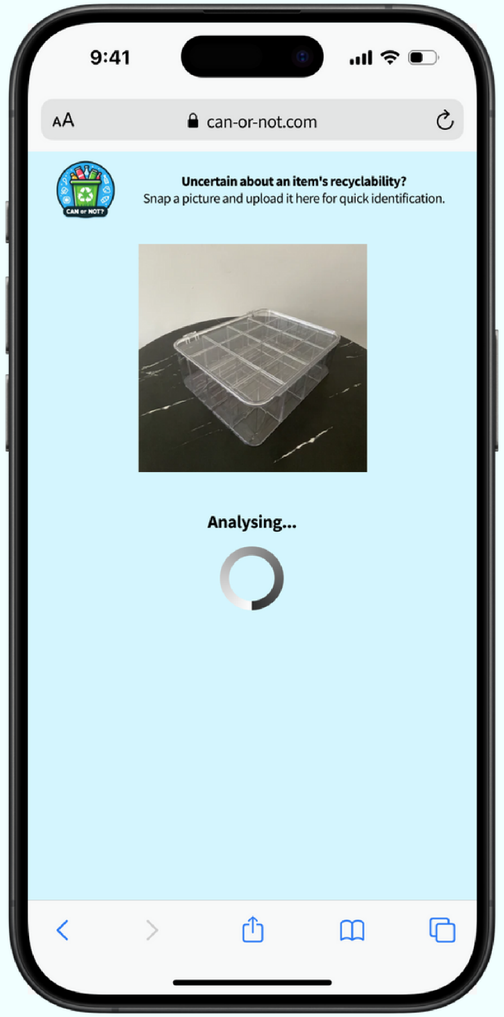
Cardboard

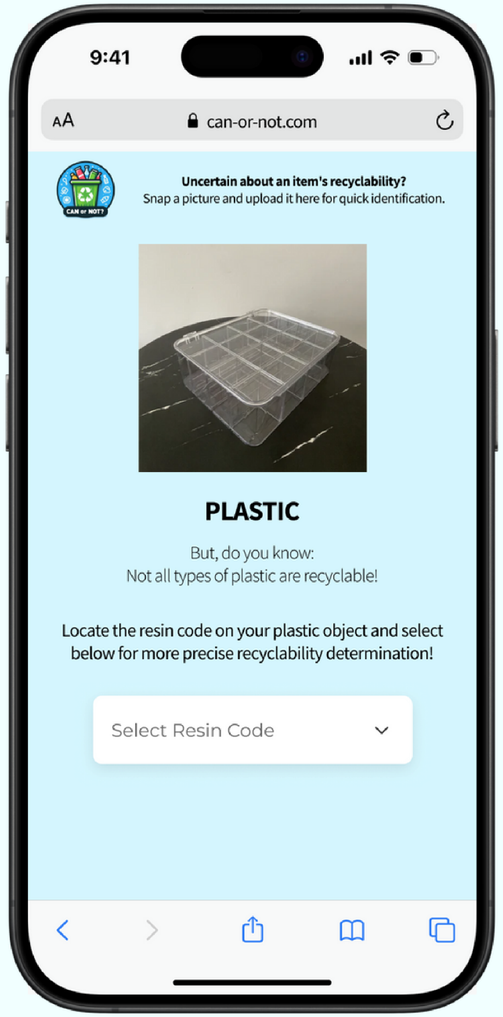
Paper

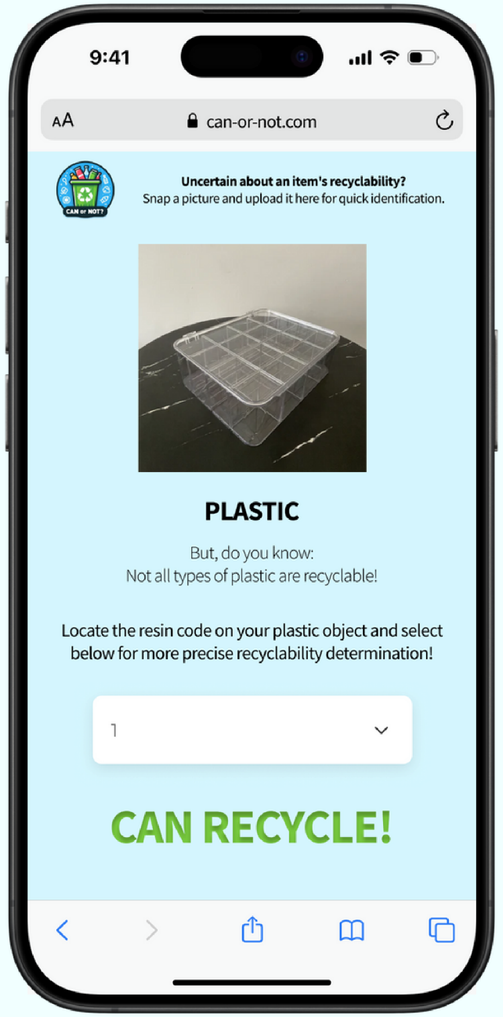
Metal

PLASTIC

Trash







LET'S DO OUR PART

By understanding the recycling process, we can all do our part to protect the environment and create a more sustainable future.

Thank you!

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