

# Trinity, Trash Master Image Classification (ML Model)



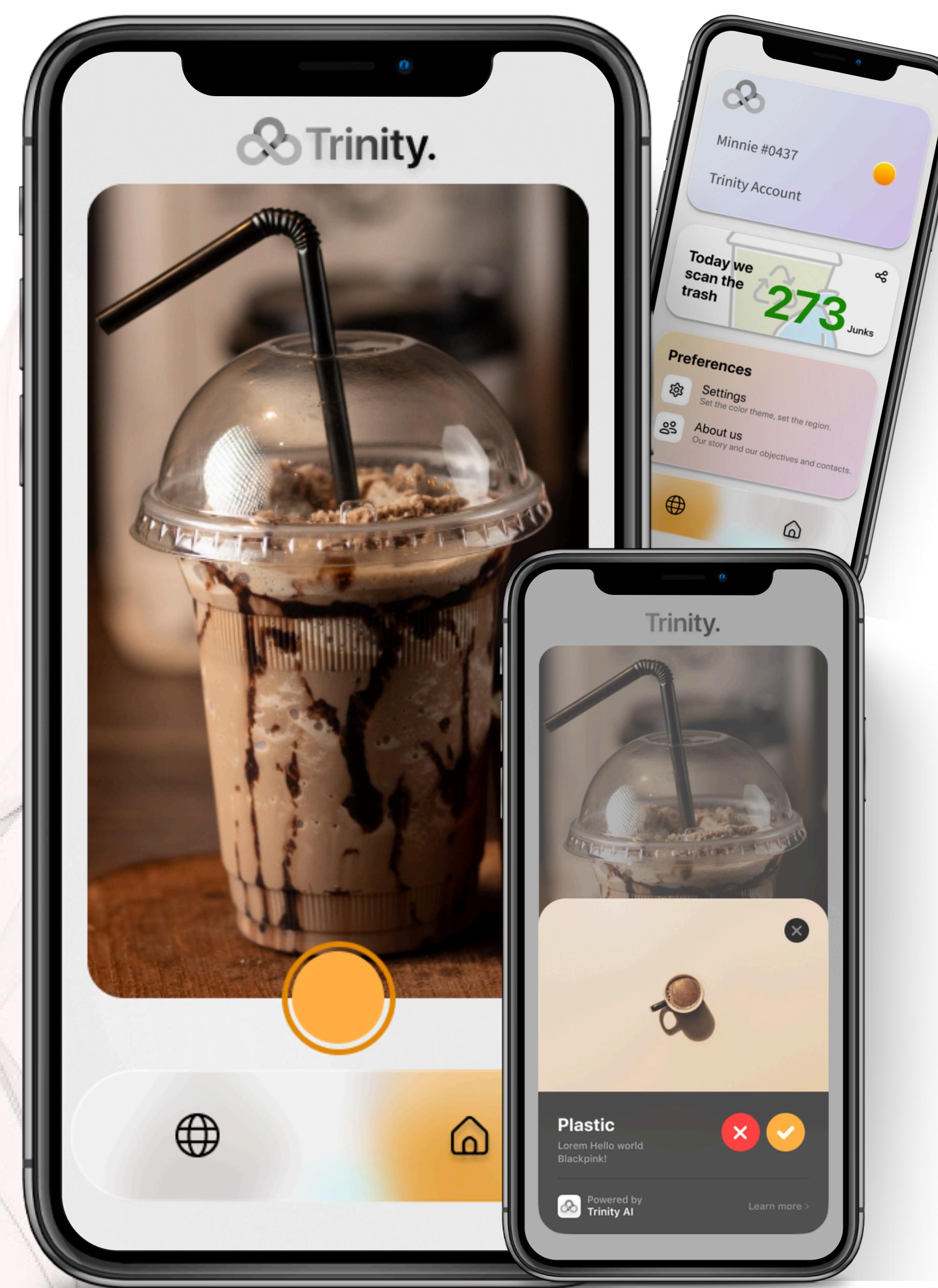
## Introduction

Due to Thailand's persistent issue of trash mismanagement and subsequent ranking among the top ten global producers of plastic-based oceanic waste, we have developed a mobile app that utilizes machine learning to sort discarded items into recyclable and non-recyclable categories. The development process comprises two phases: model development and mobile app development.

The application aims to:

- ① Facilitate recycling by lowering entry barriers
- ② Increase convenience and reduce sorting time
- ③ Categorize recyclables into four subgroups - glass, metal, plastic, and paper - and non-recyclables into six groups - ceramics, kitchenware, light bulb, photographs, Styrofoam, and wood.

OUR  
APPLICATION



## Methodology

### A. Data Acquisition Process

We utilized open-source web scraping tools like Google Lens and Downthemall to ensure that our dataset adhered to specific characteristics, such as featuring a single item and lacking commercial background, etc.



Plastic



Paper



Metal

### B. Structures for the Models

#### B.1. Model Training Environment

ResNet was trained on the Apex (A high-performance computing ) using Nvidia DGX A100, while Keras was trained on a NVIDIA GTX 1060. Due to Tensorflow version differences, Keras could not execute on the Apex system.

Model	GPU SYSTEM	APEX System
ResNet 50	NVIDIA DGX A100	YES
Keras	NVIDIA GTX 1060	NO

## Results

The following tables display the performance results of different versions of the ResNet-50 and Keras models. The final version of ResNet-50 achieved an accuracy score of 91.81%, whereas the final version of Keras obtained an accuracy of only 67.70%.

### ResNet 50

Version No.	Accuracy	Recall	Precision	F1 Score
12	97.01%	85%	94%	88%
13	93.88%	77%	89%	81%
14	93.88%	75%	87%	79%
15	91.81%	82%	90%	85%

### Keras

Version No.	Accuracy	Recall	Precision	F1 Score
1	64.84%	65%	66%	64%
2	67.70%	68%	68%	67%

We have accomplished the initial phase of the project, which entailed model development. Our Resnet model is capable of accurately categorizing discarded items at a satisfactory rate, with each testing metric returning a result of at least 80%. In the upcoming phase, we will focus on integrating the Resnet model and developing a mobile application.

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