

GREENIFY

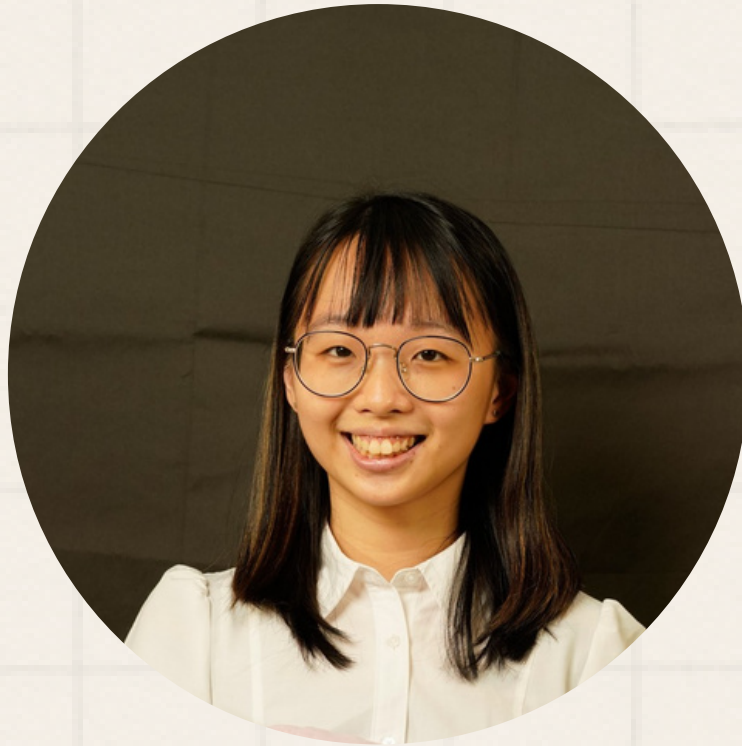
YOUR RECYCLE MENTOR



2023 Google HPS Group 9
Mentor: Sean Liu



Team Members



Alice Du
(Hardware)



Angel Chen
(UI/UX)



Berlin Chen
(Back-end)



Oliver Hua
(Front-end)



Scott Lin
(Industrial Design)



E-invoice: Where should it belong to?!



General Waste

Recycle

E-invoice: Where should it belong to?!



General Waste

Recycle

台灣每人平均一年產生 **417** 公斤垃圾。

台灣 **94%** 民眾有回收習慣，

只有 **不到三成** 的人把回收丟對。

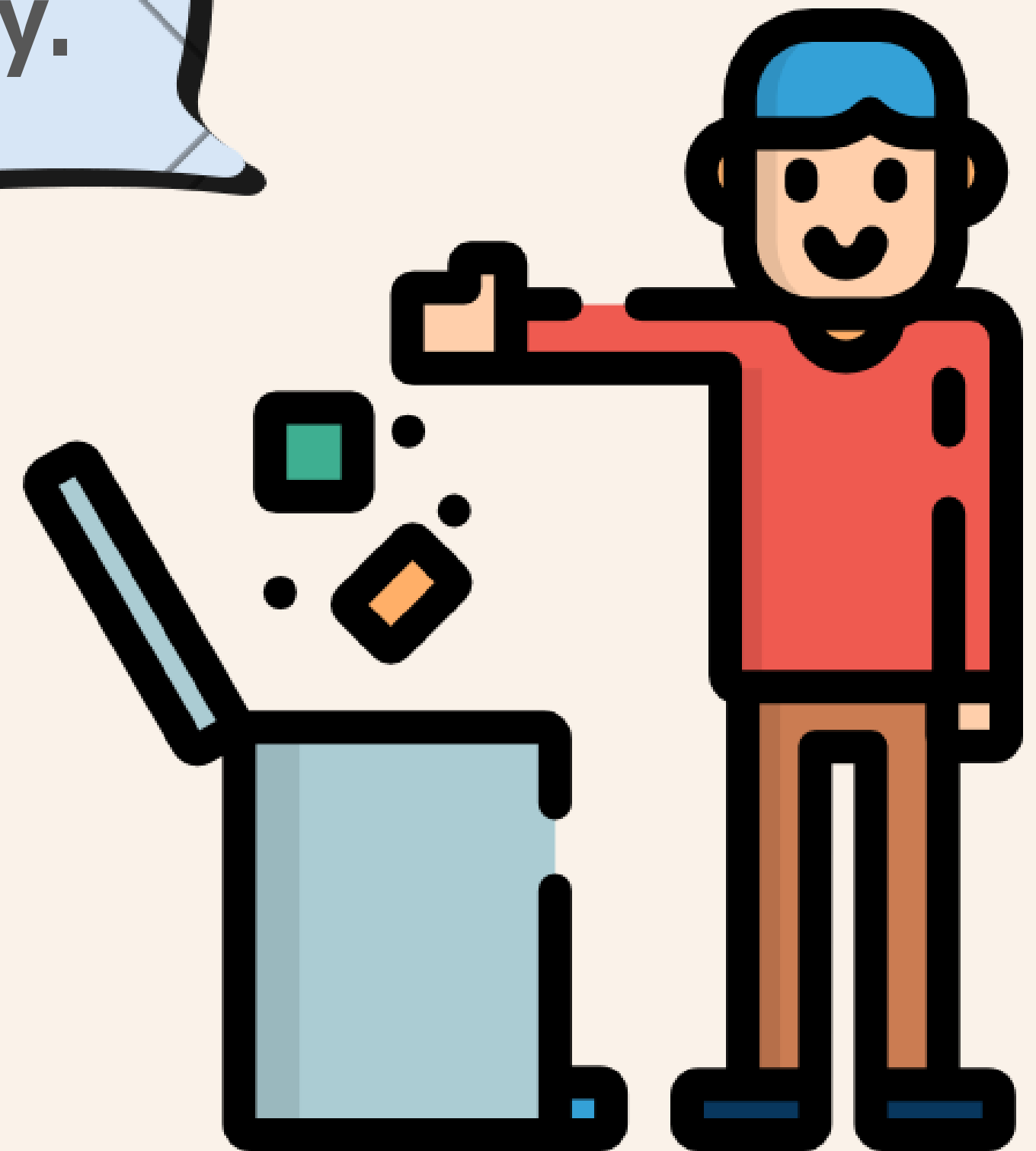
大家遇到的回收難題？

(可複選)

資料來源：
RE-THINK 重新思考於
2022/5/26-2022/6/12 於社
群平台發放之
「2022 台灣回收意願調查」
問卷，蒐集有效樣本數共
2,915 份

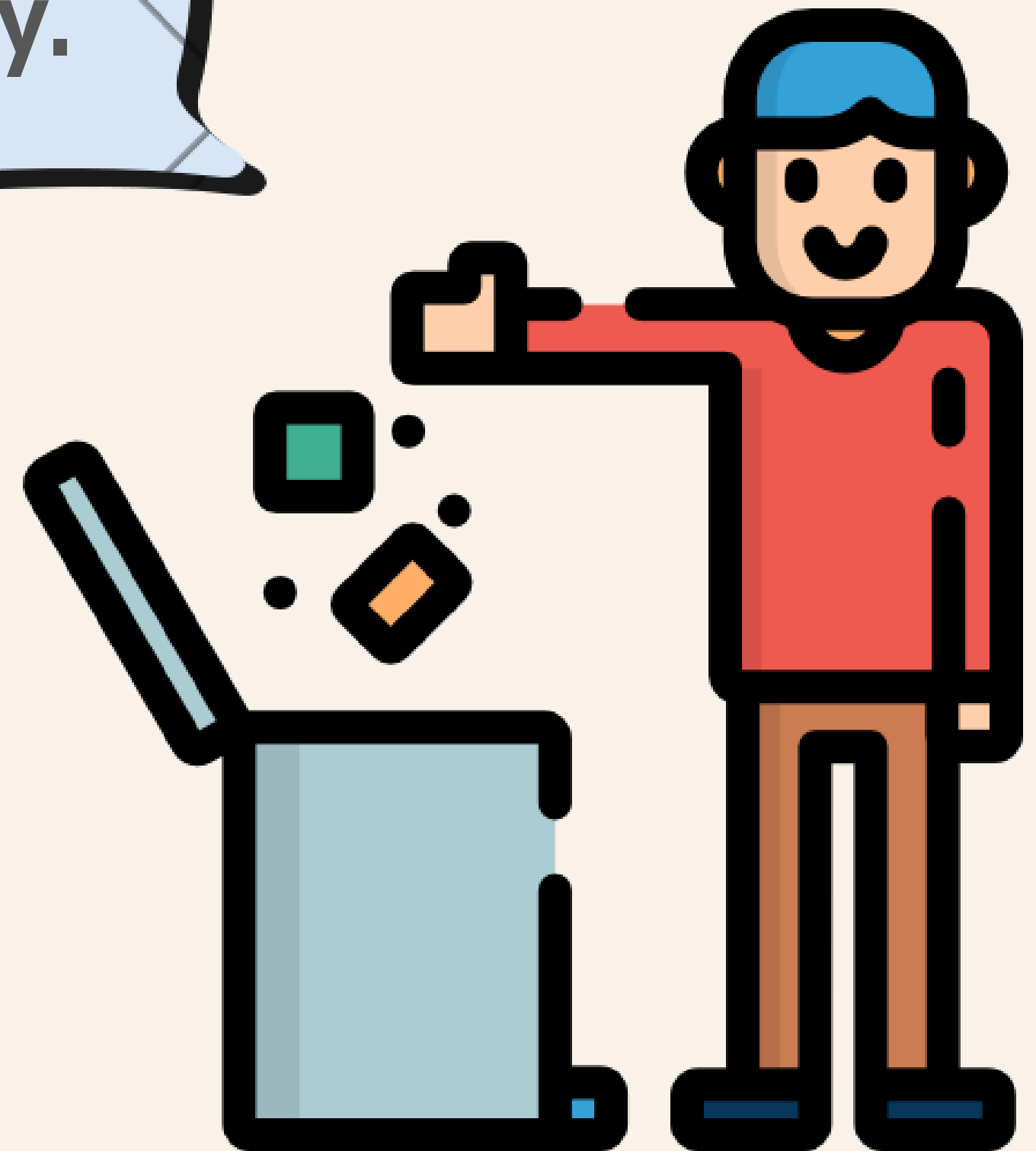


We may all accidentally throw
garbage in the wrong category.



We may all accidentally throw
garbage in the wrong category.

SO WHAT?



Let's see where the garbage goes

可回收物品被丟到分類站集成堆。之後由裝運機把材料移到輸送帶上。

利用轉盤把硬紙板從回收物堆中分離出來，較小的物品則會通過並繼續往下走。



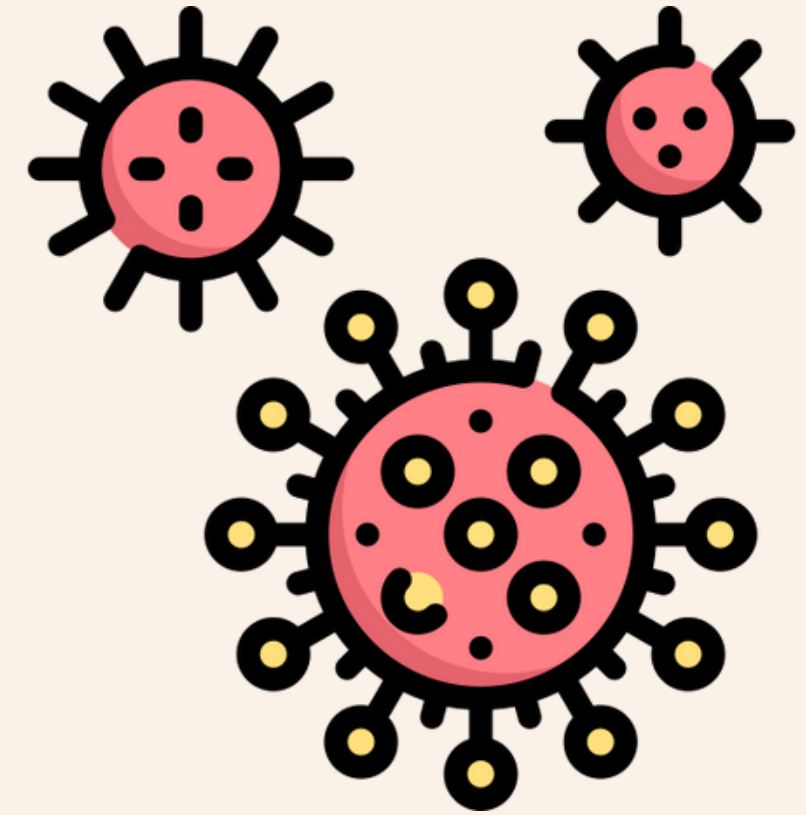
If not processed & classified properly...



More time and
human effort



More **cost**
on cleaning



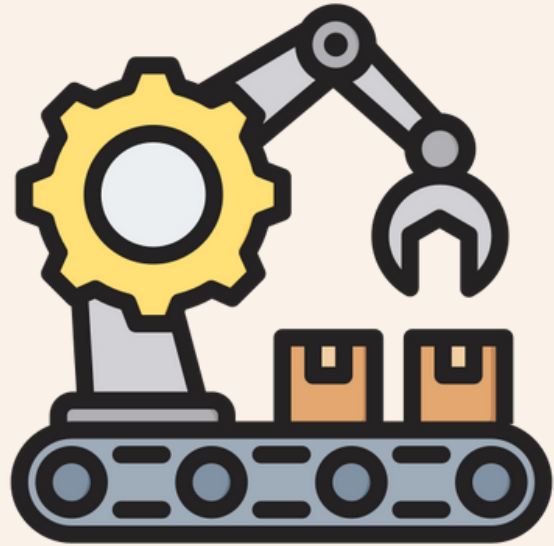
More risk of
spreading **disease**

If not processed & classified properly...

**BECOME
GENERAL
WASTE!!**



What can we do?

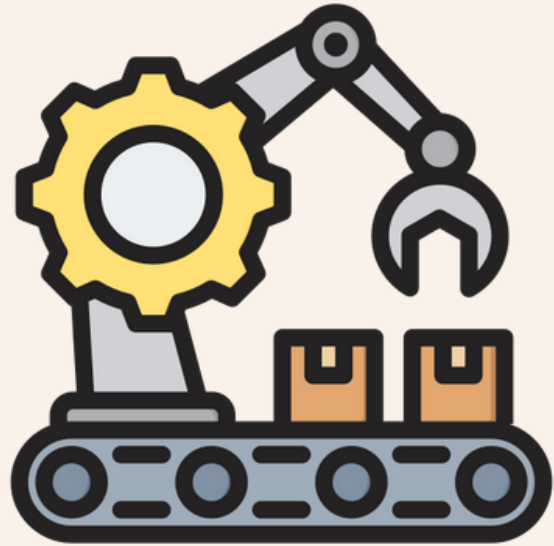


Automatic Classification



Recycle Education

What can we do?



Automatic Classification

- ML Image Recognition
- Mechanism Design



Recycle Education

- Educational story-telling animation



PLEASE SAVE OUR
PLANET FROM NOW ON!

CLICK
HERE

5

Feature & Progress

**Product
Deisgn**



**Hardware
System**



**UI/UX
Design**



**Software:
Front-end**



**Software:
Back-end**

Mechanism

Signal

**Story
Setting**

REACT

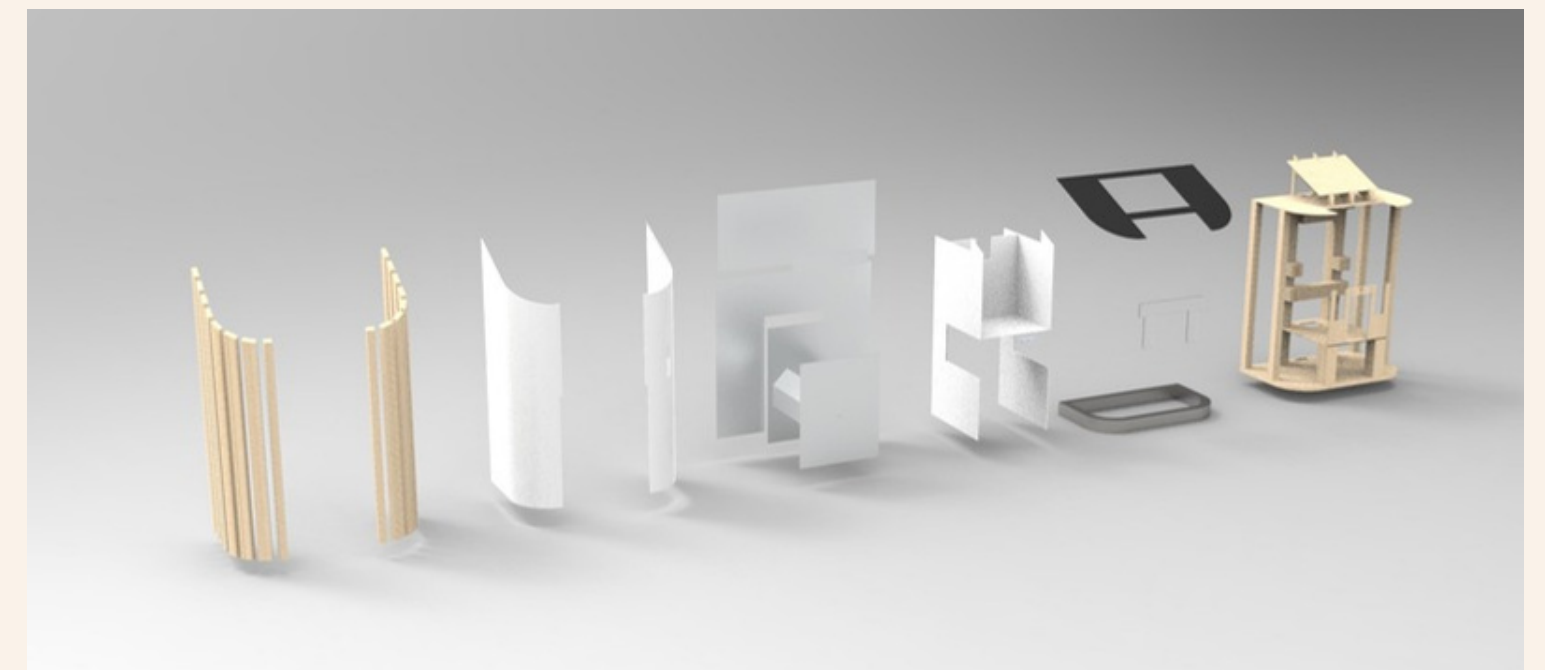
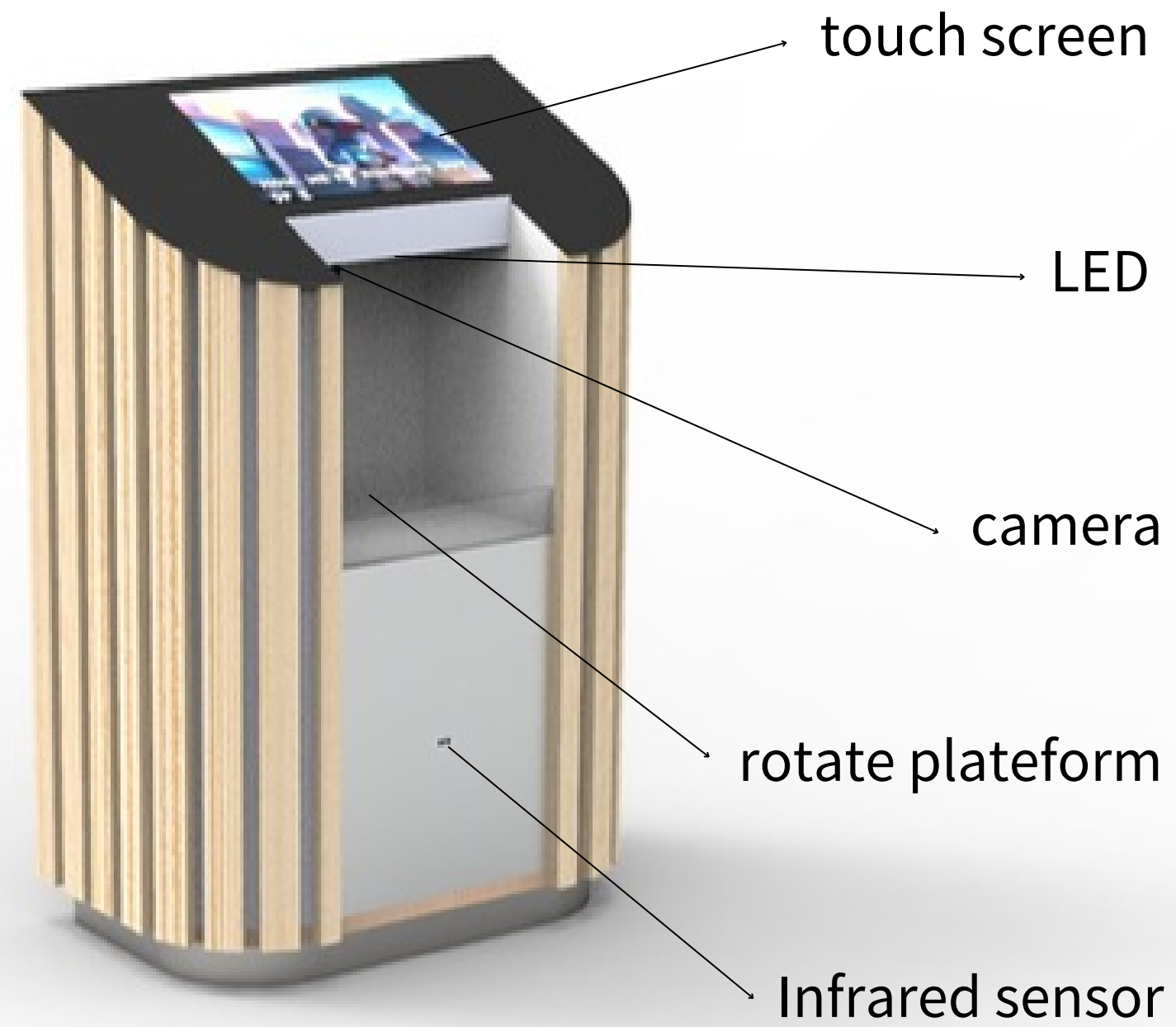
ML

Power

**Educational
Content**

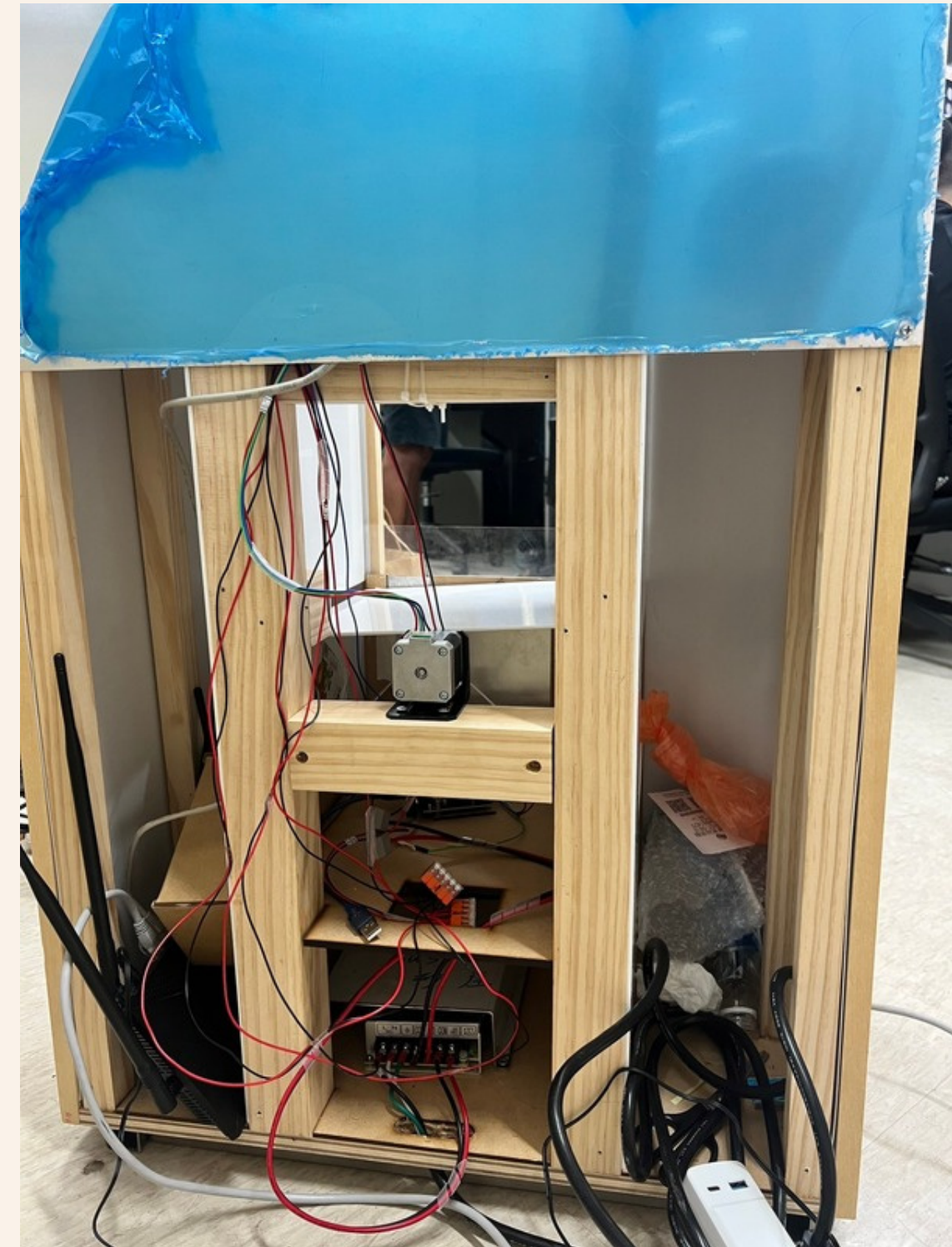
HTTP

Flask



Power

- **Power supply: AC to DC**
- **12V for Step motor**
- **5V for all the others**



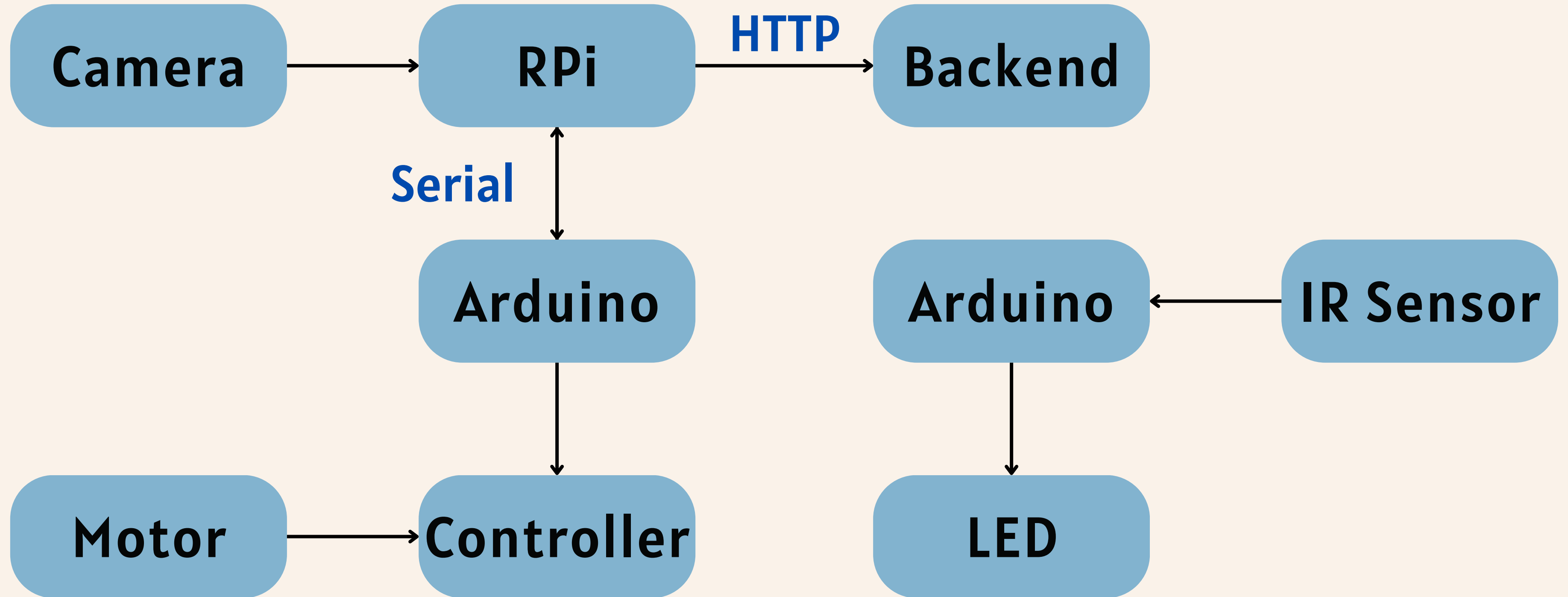
Product Design

Hardware

UI/UX Design

Front-end

Back-end



Signal

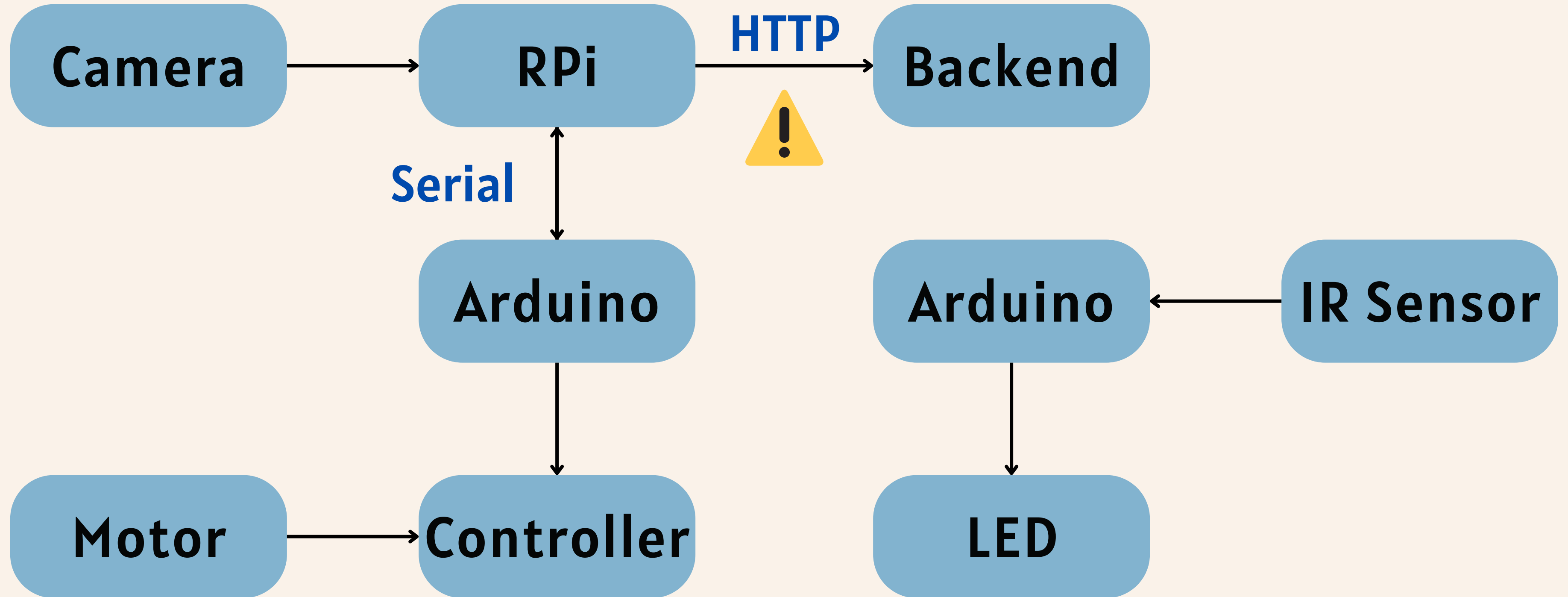
Product Design

Hardware

UI/UX Design

Front-end

Back-end



Signal

Product Design

Hardware

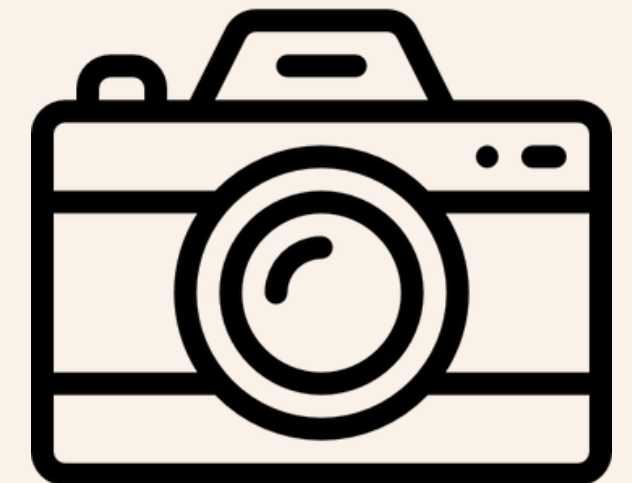
UI/UX Design

Front-end

Back-end

Challenge

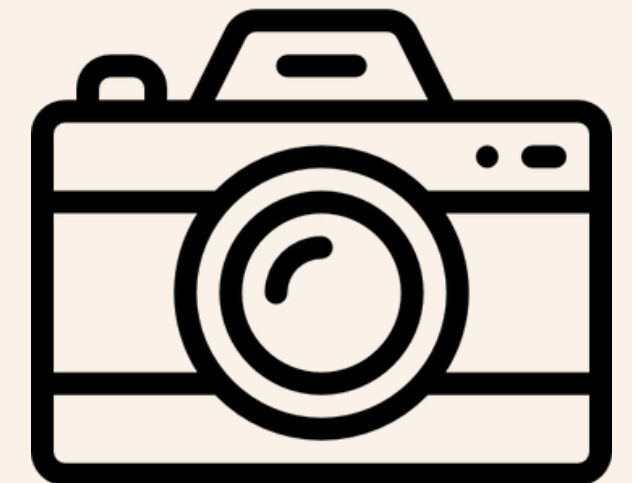
When should a image be sent to the backend



Solution

RPi will check

- 1.If the garbage exists**
- 2. Is the image stable**



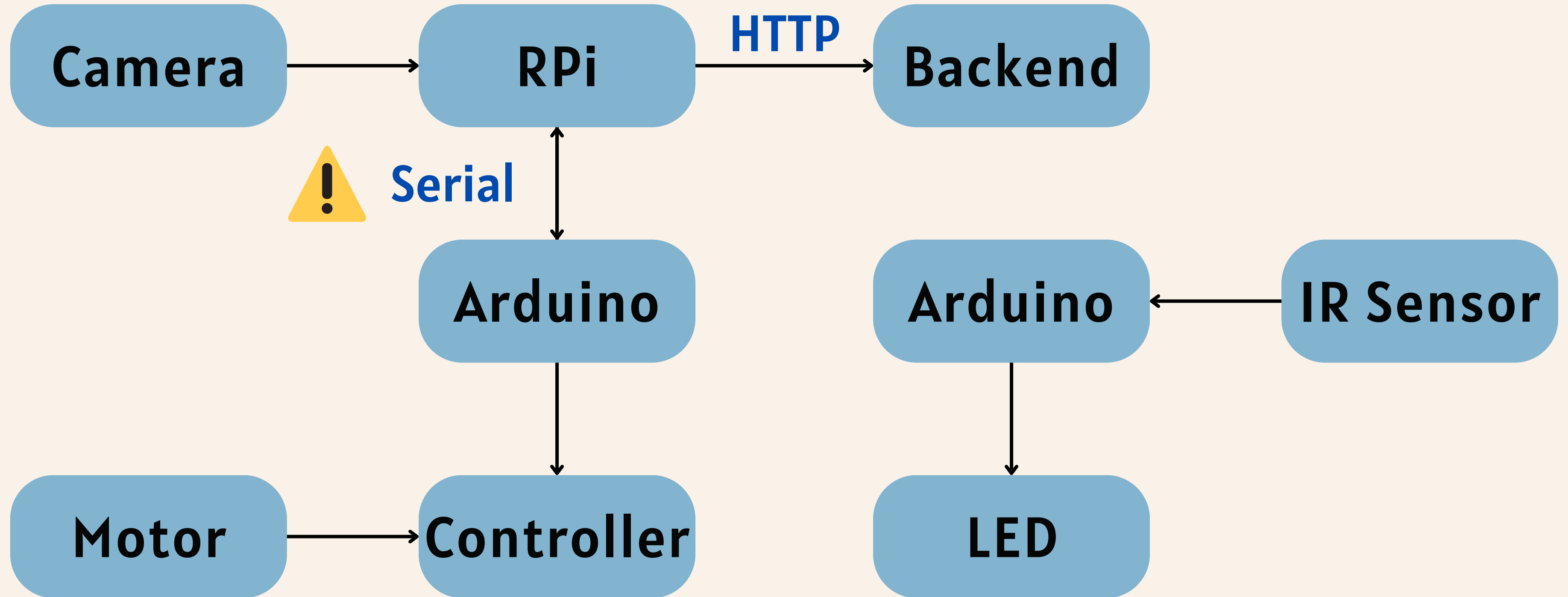
Product Design

Hardware

UI/UX Design

Front-end

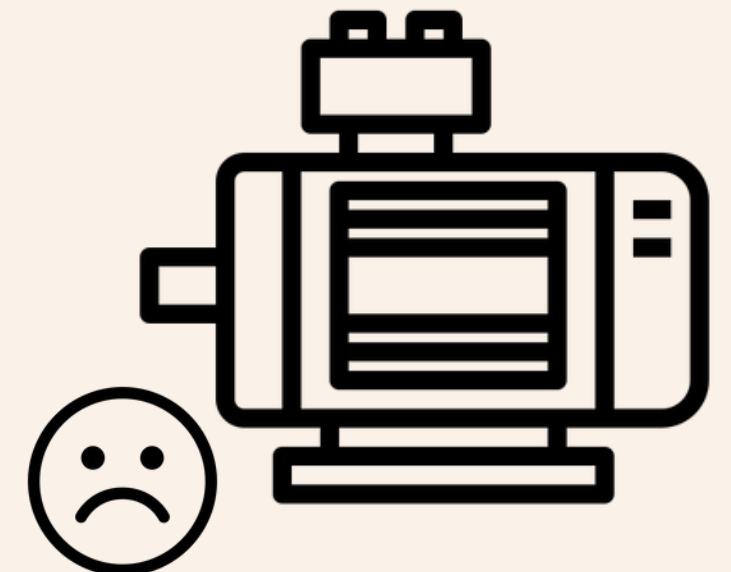
Back-end



Signal

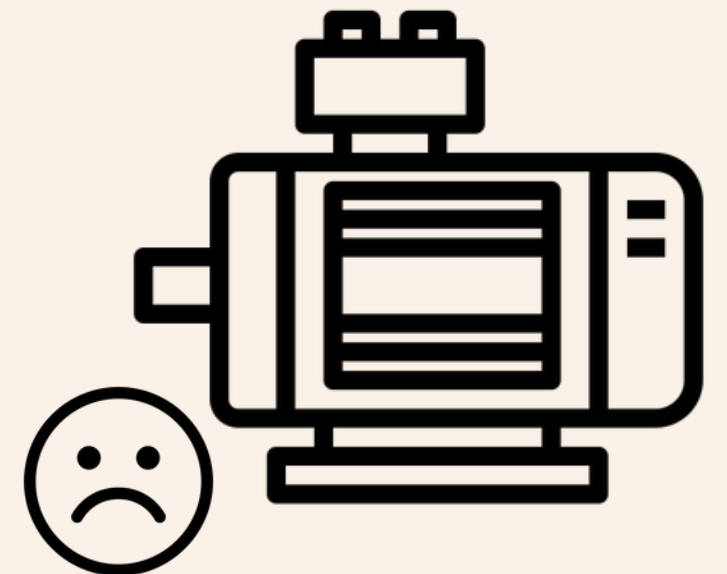
Challenge

Motor vibrates unexpectedly



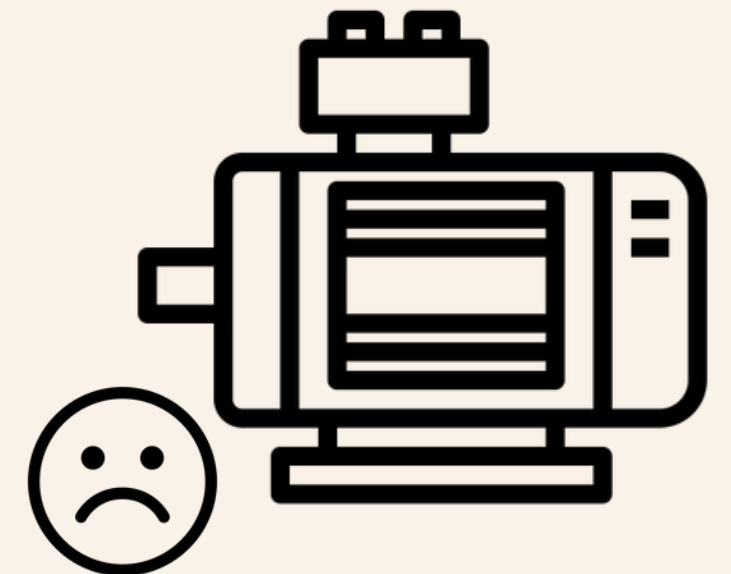
Challenge

Arduino sends noise signal to motor
Motor vibrates unexpectedly



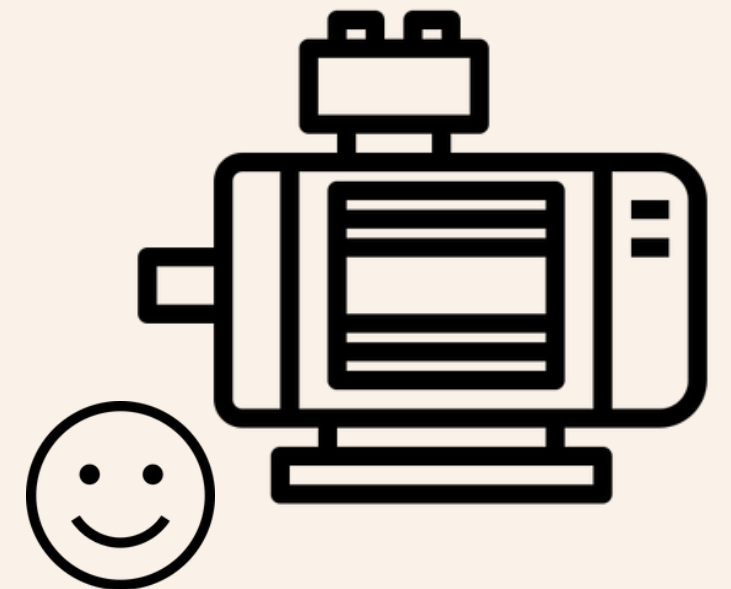
Challenge

Arduino resets after opening Serial
Arduino sends noise signal to motor
Motor vibrates unexpectedly



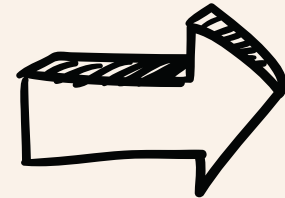
Solution

**Power RPi and Arduino and open Serial
Before turning on the power of motor**



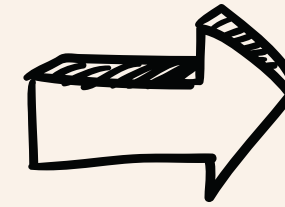


1. 起始動畫



觸控螢幕

2. 指示動畫

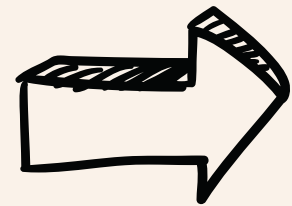


影像辨識
放上垃圾

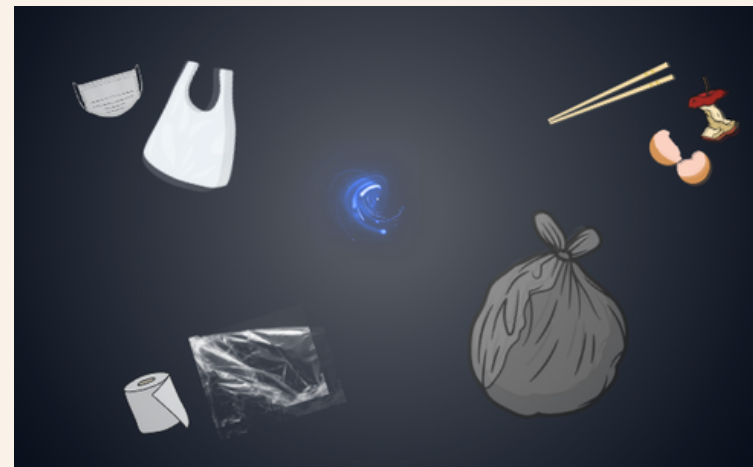
3. 一般任務



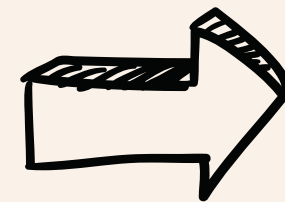
4. 成敗互動 & 趣味教學



接續
一般任務

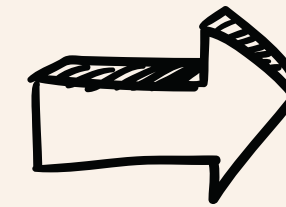
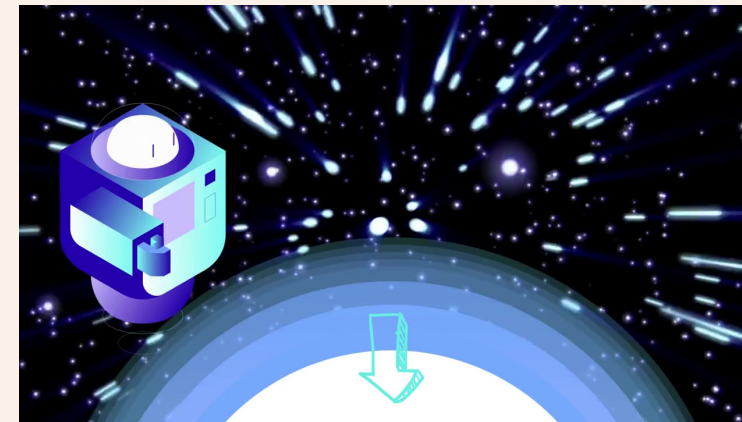


1. 起始動畫



觸控螢幕

2. 指示動畫

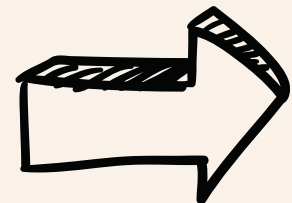


影像辨識
放上垃圾

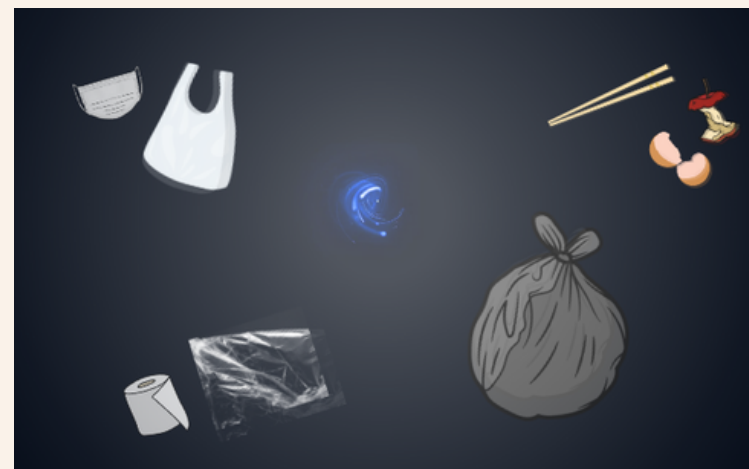
3. 一般任務



4. 成敗互動 & 趣味教學

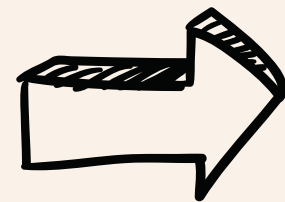


接續
一般任務



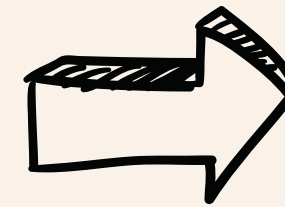
可燃物的垃圾處理流程包括

1. 起始動畫



觸控螢幕

2. 指示動畫



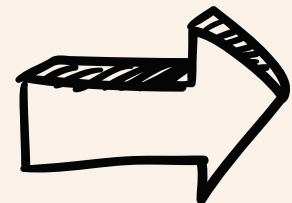
影像辨識
放上垃圾

3. 一般任務

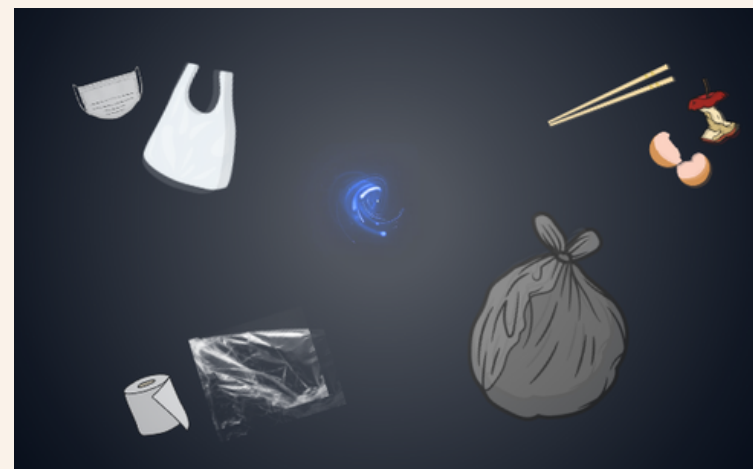


4. 成敗互動 & 趣味教學

for 台灣 4 大分類垃圾：紙類、塑膠、鐵鋁罐、一般垃圾
& 4 項易混淆分類之垃圾：水果網套、薄塑膠袋、泡泡紙、電子發票

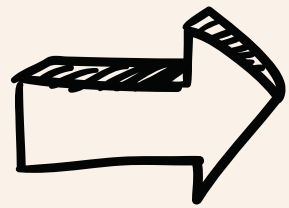


接續
一般任務

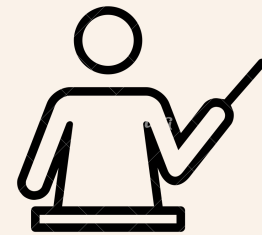
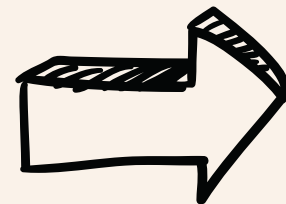


for 台灣辦公室最常見的垃圾之一：手搖杯飲料！

3. 特殊任務

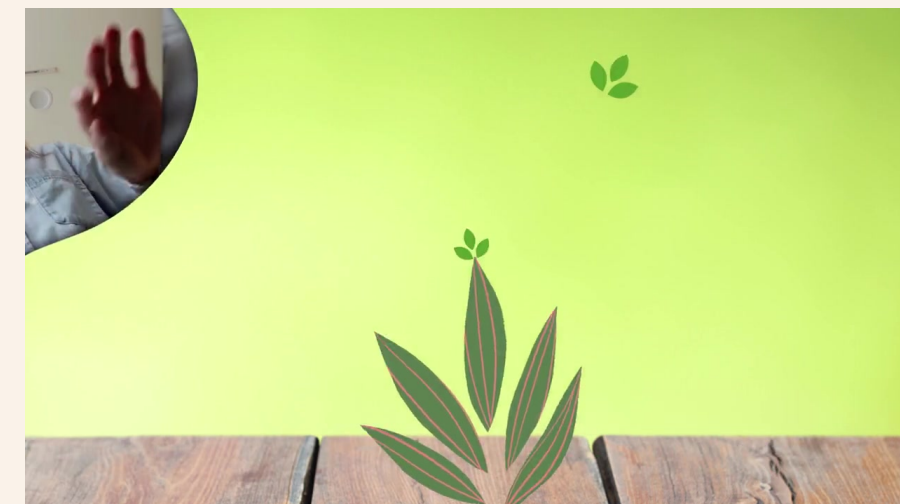
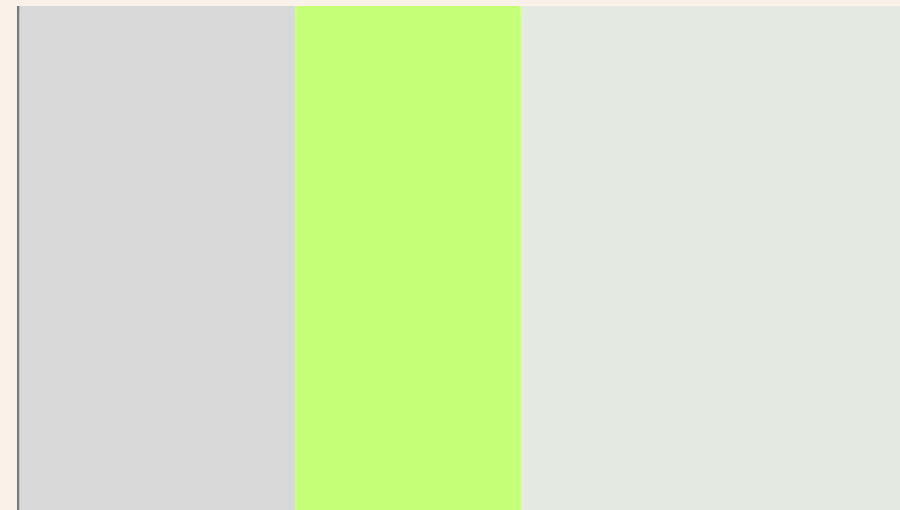


影像辨識
放上垃圾

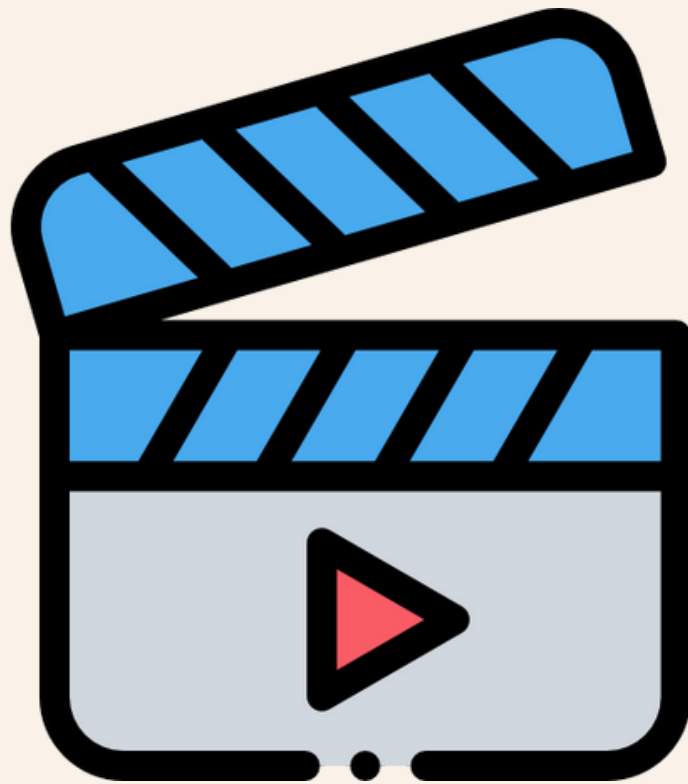


教學開始

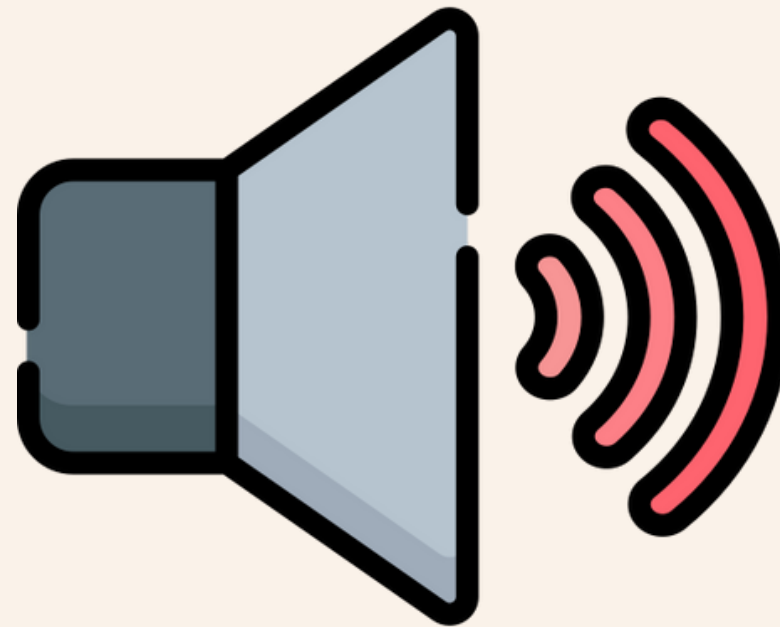
4. 手把手趣味教學



Our Requirements



Animation



Sound Effect

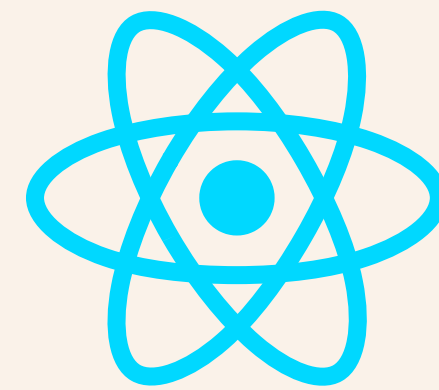


Interaction

Our Tech Stack



**Traditional RPi UI
is not sufficient**



React



**Powerful Frontend
Web Programming Tools**

Our System

Frontend

- UI / UX
- Touch Panel

HTTP



Backend

Flask
Model Inference
(EfficientNet)

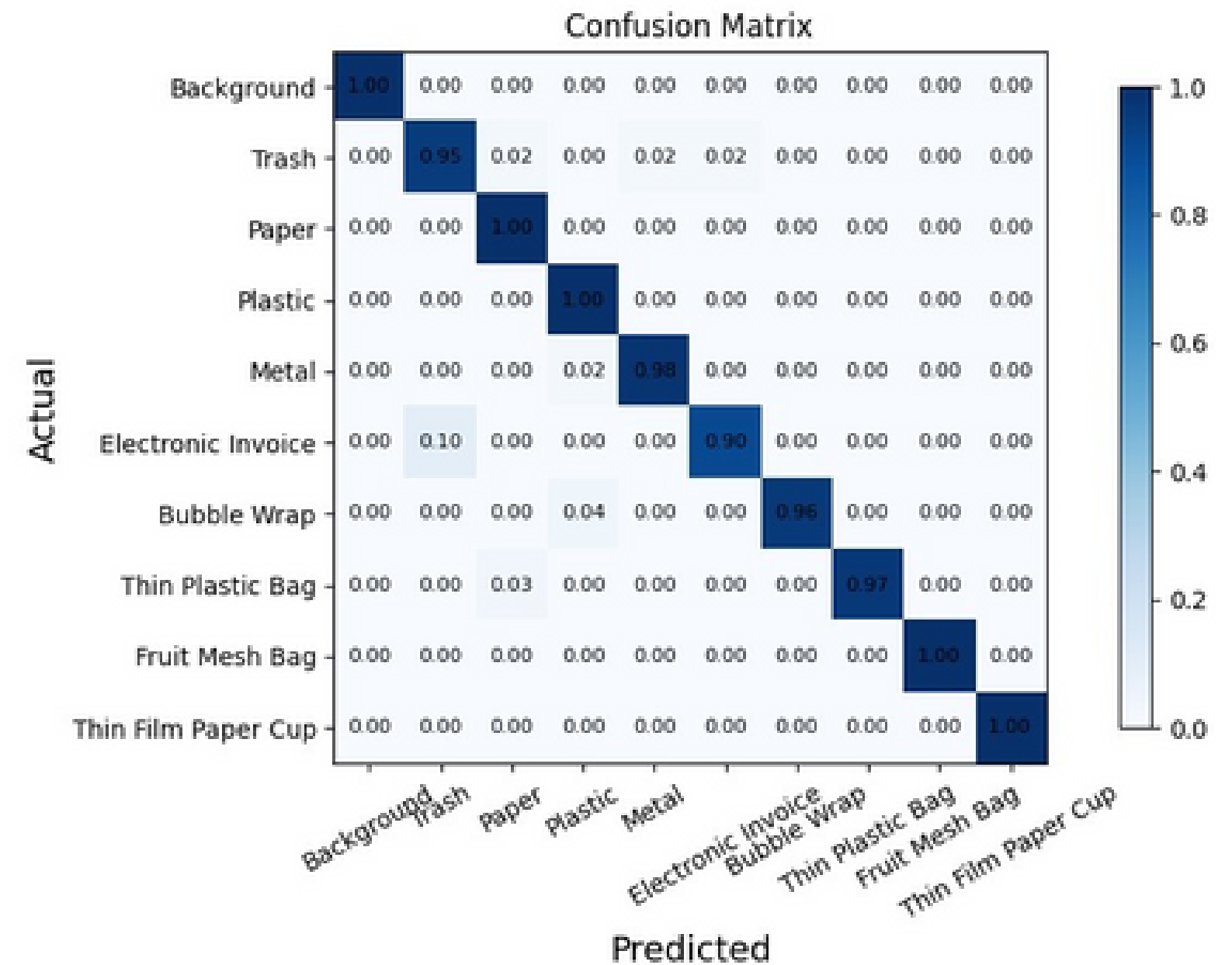
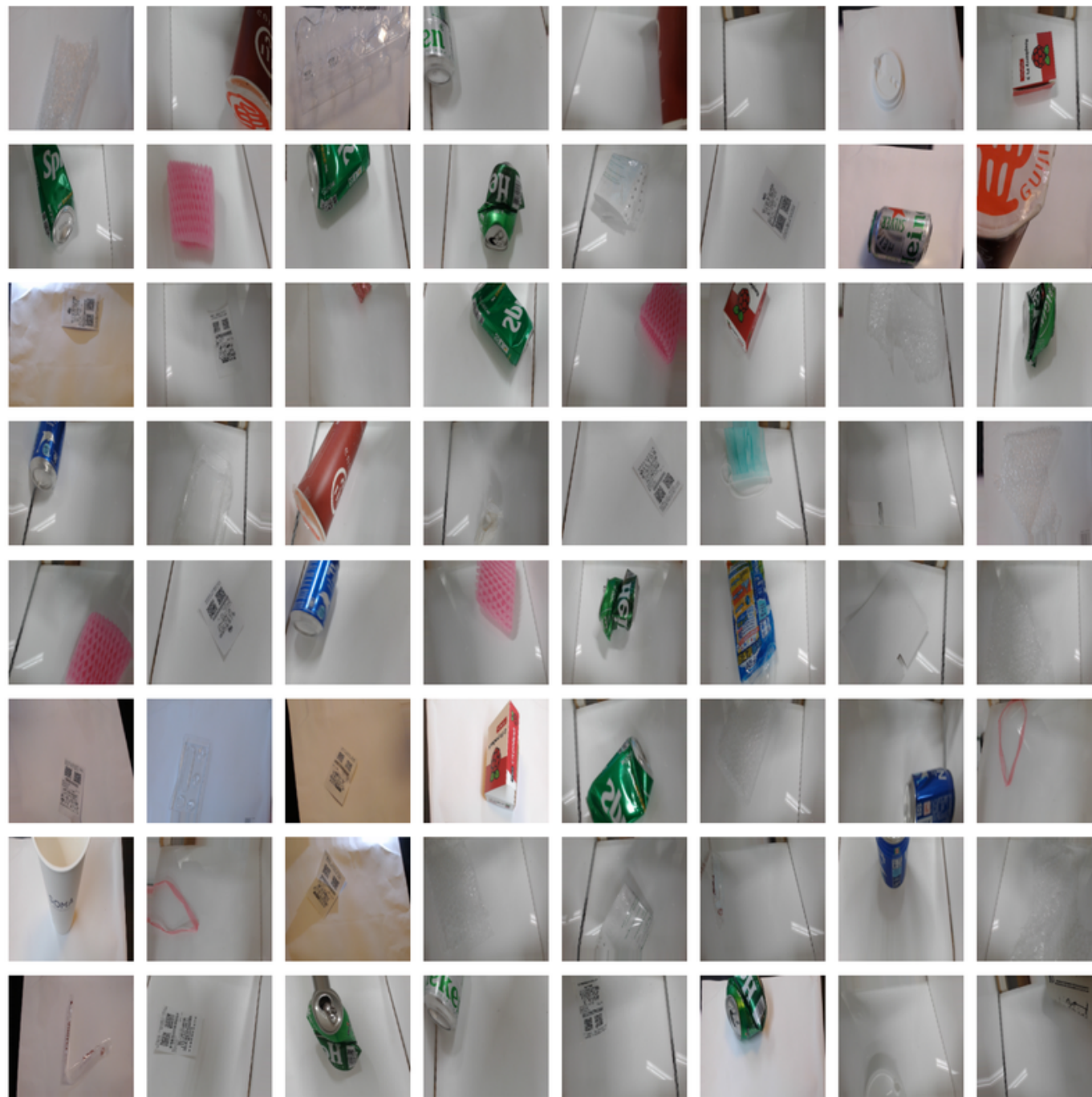
HTTP



Hardware

- RaspPi
- Arduino
- Stepper

Image Classification



Achievements

1. Innovative Trash Bin with Accurate Classification Model
2. Engaging and Attractive User Interactions
3. Educational Games for Garbage Classification

Outlook

1. Enhancing the accuracy & range of recycling classification!
2. Attracting storyline for Office Workers and School Students!



