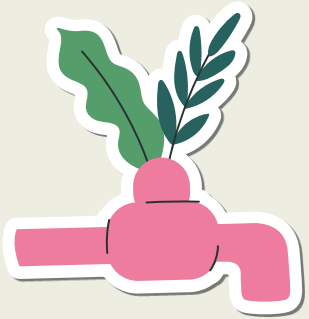
BinVision

Ronak Agarwal, Shyamanth Kudum, Sohan Malladi, Arnav Patidar, and Rohit Prasanna

Table of contents

01

Mission



Mission

Problem

- Currently, less than 30% of what is put in Georgia Tech's recycling bins are actually recycled.
- This is not representative of the aims of the Zero Waste initiative set forth by President Cabrera.
- One of the main contributing factors to that statistic is waste misclassification

Solution

- What if there was a way for students, faculty, and staff to quickly identify which bin to throw away their waste?
- A module that uses computer vision to identify contamination percentage and material of the waste being thrown away

Zero Waste Initiative

Solid Waste

Non Hazardous waste should be dealt with in an efficient and effective manner.

Recycling

Recycling should become less of a hassle and more accessible with more recycling locations on campus.

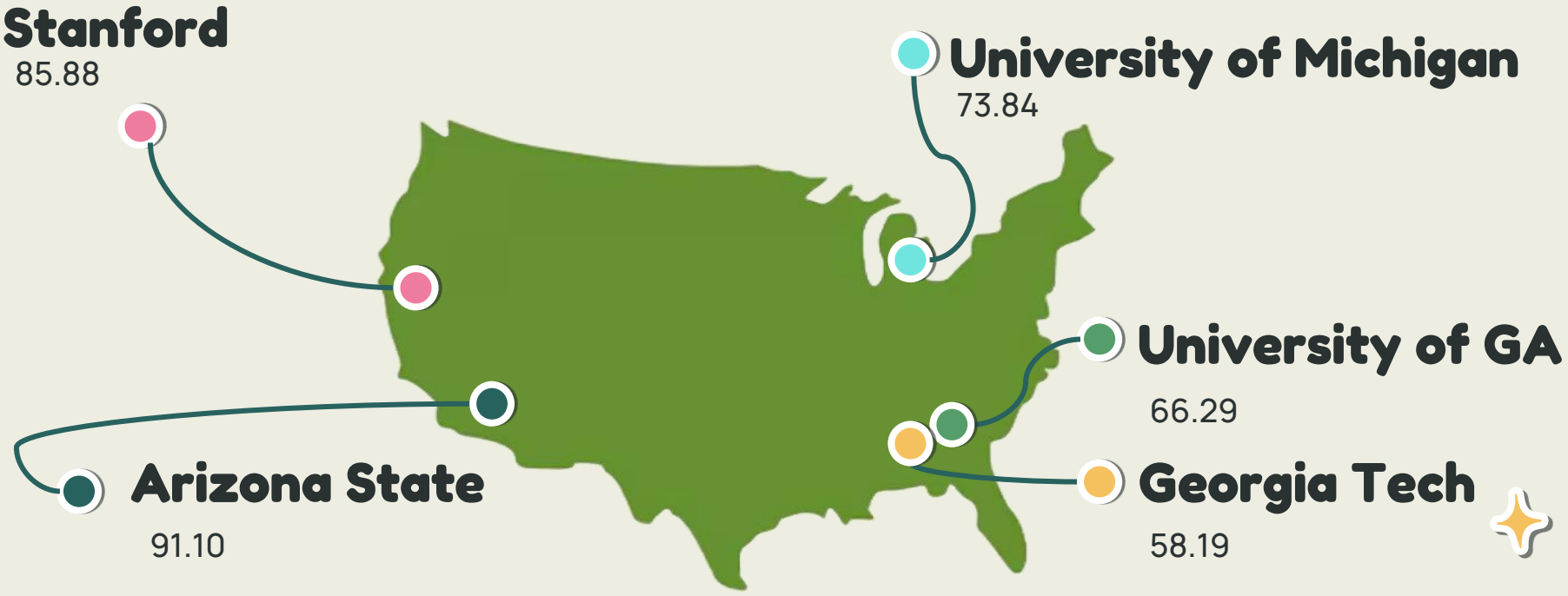
Awareness

For Zero Waste to work, everyone on campus must participate and understand the importance of Zero Waste.

17,312,100

Pounds of Waste put in Landfills by Georgia Tech in 2021

How do we compare to other schools?



BinVision!

What it is

BinVision is a **waste classification module** that is broken up into software and hardware.

Software - full stack web application that employs **machine learning** and cloud storage to accurately identify waste as **classifies it based on camera** input, storing statistics.

Hardware - a **raspberry pi based module** that has a **proximity sensor** and camera to input data into the software end

What it Solves

Recycling

BinVision decreases recycling contamination by increasing the recycling accuracy

Awareness

BinVision increases awareness amongst students and faculty to what they are actually putting into each recycling bin

Demo

How it works

01 Proximity Sensor
Place waste within 20 cm

02 Camera
Proximity activates camera

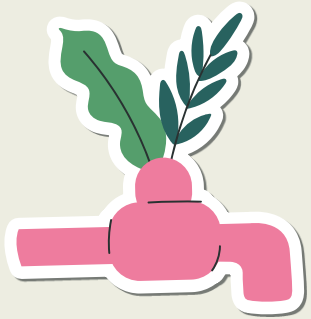
03 ResNet
Picture is inputted to model

04 Prediction
Prediction text updated in app

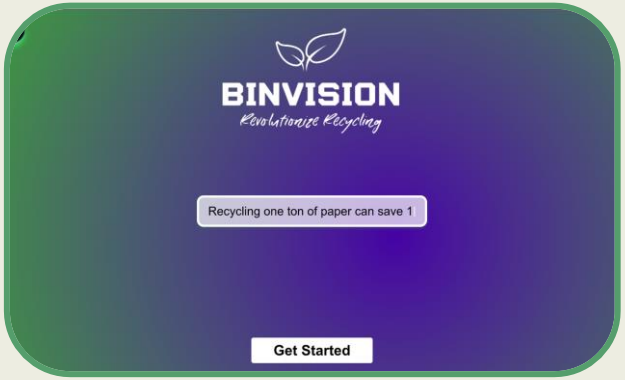
05 Analysis
Statistics for Bin # updated

02

Software



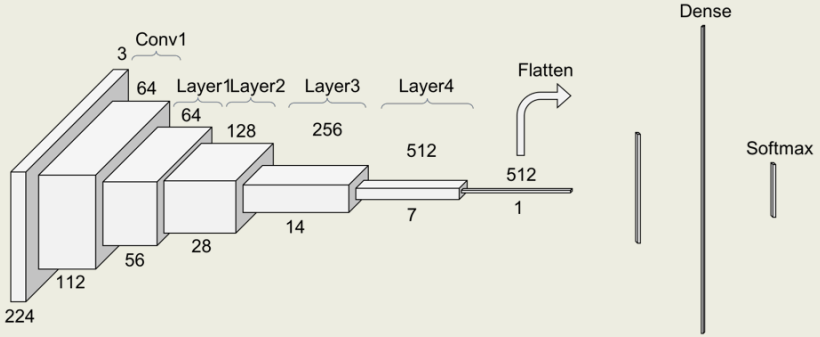
Frontend

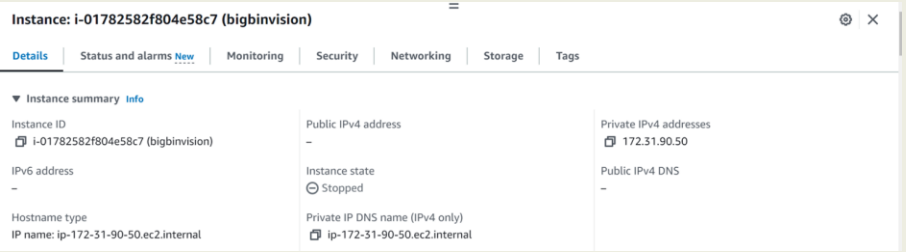

BINVISION
Revolutionize Recycling
Recycling one ton of paper can save 1
Get Started


BinVision
Bin 1


BinVision
Scan Item
Bin Statistics
Recycled
Trashed
Composted
529
314
228
Bin 1

Backend

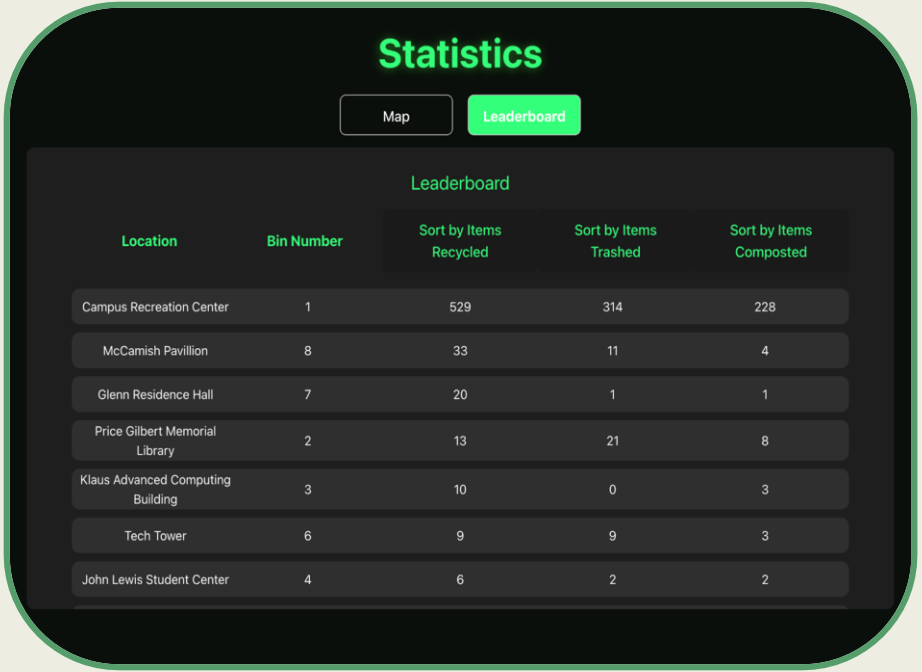




- Powered by a ResNet 34 classification model that uses previously labeled recycling images as the data set to correctly provide an output.
- Connected to the frontend using a flask server and node to deploy the web application
- Machine learning model is deployed on an AWS EC2 instance

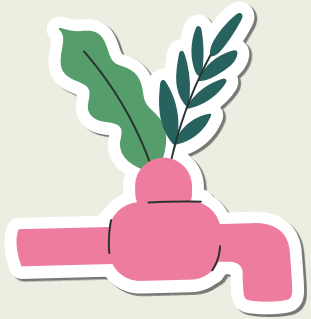
Statistics

- BinVision keeps track of all items recycled, trashed or composted
- Stores all the statistics for each bin on a Google Firebase database
- Statistics can be accessed by each individual bin and displayed to user
- Overall statistics can be used to see patterns in recycling traffic and accuracy



03

Hardware



5 Components for Hardware

LCD Display

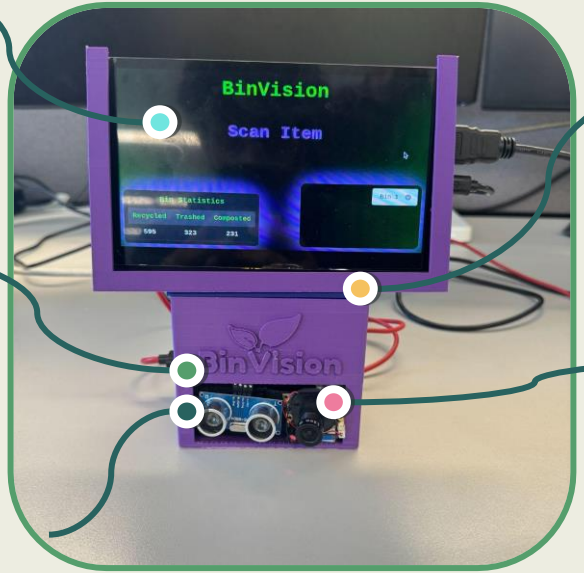
Cost-effective, user-friendly display

Raspberry Pi

Mini computer

Proximity Sensor

Ultrasonic sensor to detect user input



Case

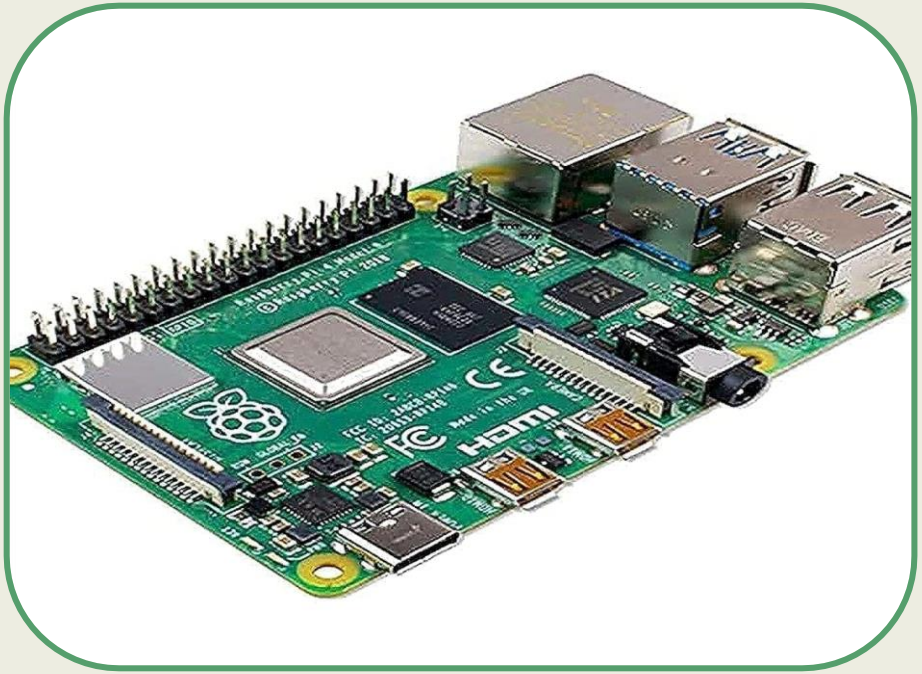
3D printed Case that is attached to recycling bin

Camera

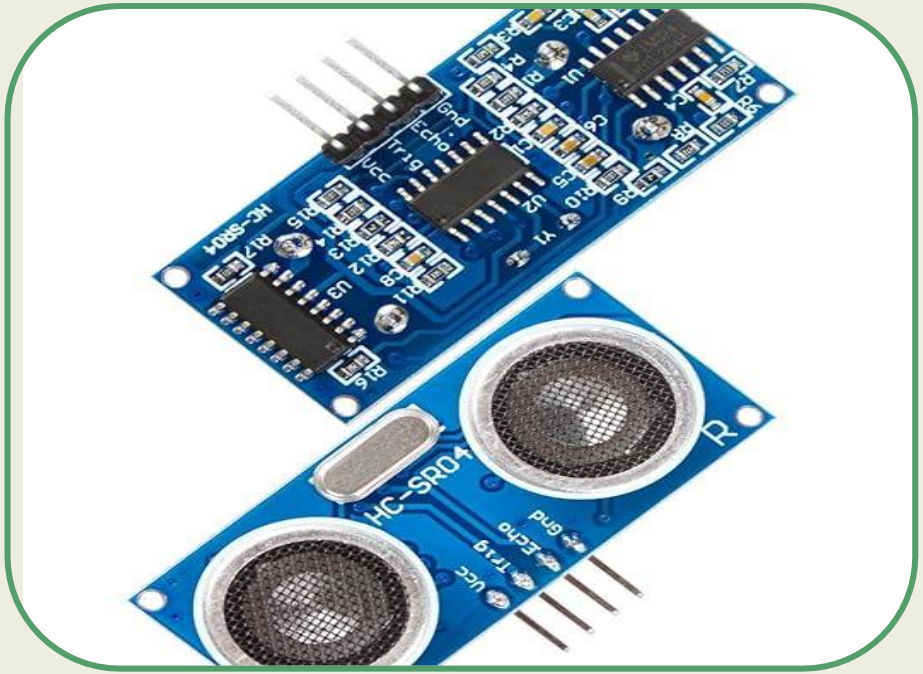
3D printed Case that is attached to recycling bin

Raspberry Pi

- A mini computer that runs all the frontend code, camera, and proximity sensor code on it locally
- Acts as the central point for the proximity sensor and the camera, allowing every module to be fine-tuned in the future



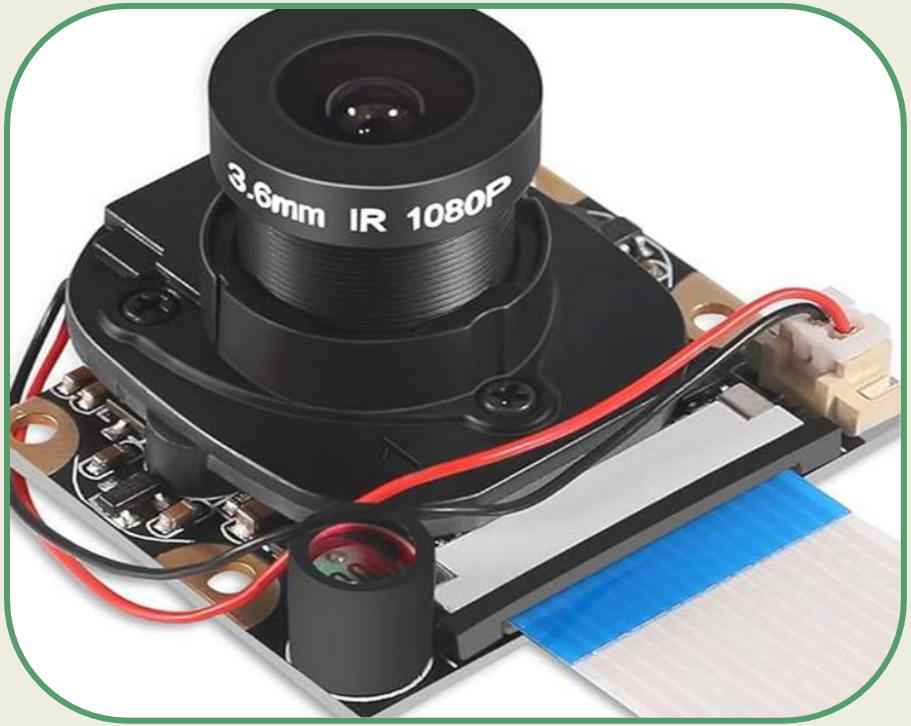
Proximity Sensor



- We only want the output to be displayed if a user is close enough where they are presenting waste
- Ultrasonic wave sensor that calculator distance by constantly sending out waves and seeing how long it takes for the wave to come back and hit the receiver.
- Camera input is only fed into the model when the proximity sensor detects distance less than 10 cm

Camera

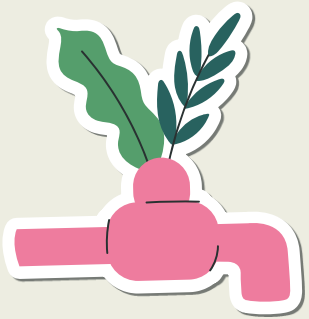
- 1920x1080p HD camera that takes a picture of the waste once it reaches 10 cm away from the module.
- Code sends the image taken by the camera to the AWS EC2 instance for the prediction.
- Camera resets every couple of seconds when it senses something 10 cm away.



Case

04

Outlook



Next Steps

Battery Power

Aim to make the module battery powered

Self-Sorting

Implement hardware to sort waste based on prediction

Variance Tests

Compare actual images taken vs predictions

Cross Campus

Implement more modules around campus

Statistics

Draw meaningful conclusions from statistics

Educate

Educate students about the importance of proper identification of waste

Thanks!

Do you have any questions?