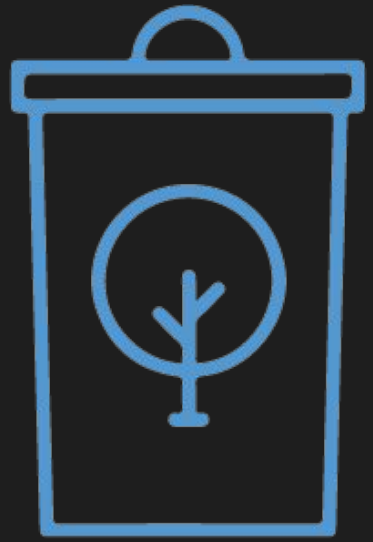


trash.py

Meet the team

Ethan Davis

ML/Computer Vision Lead

B.S.E. EECS ‘22

Marcela Lebrija

Design and Manufacturing Lead

B.S.E. Mechanical Engineering ‘22

Did you know?

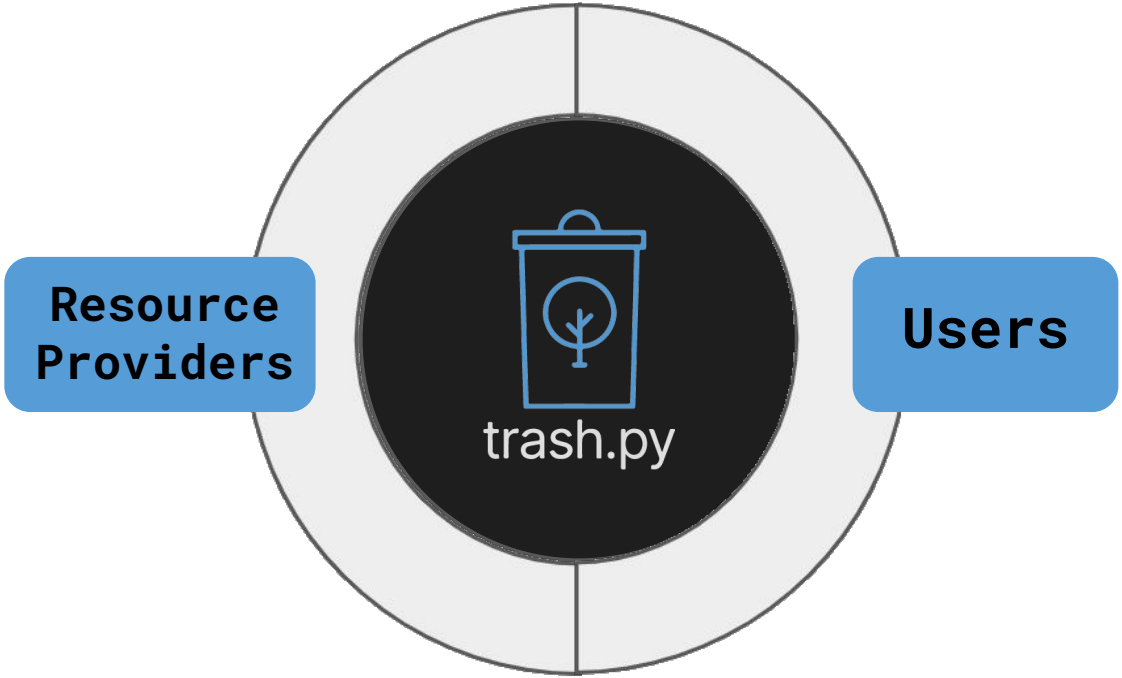
91%

of plastic **doesn’t get recycled** and just sit in landfills annually

Source: epa.gov

trash.py

Stakeholders



Stakeholders

Pain Points

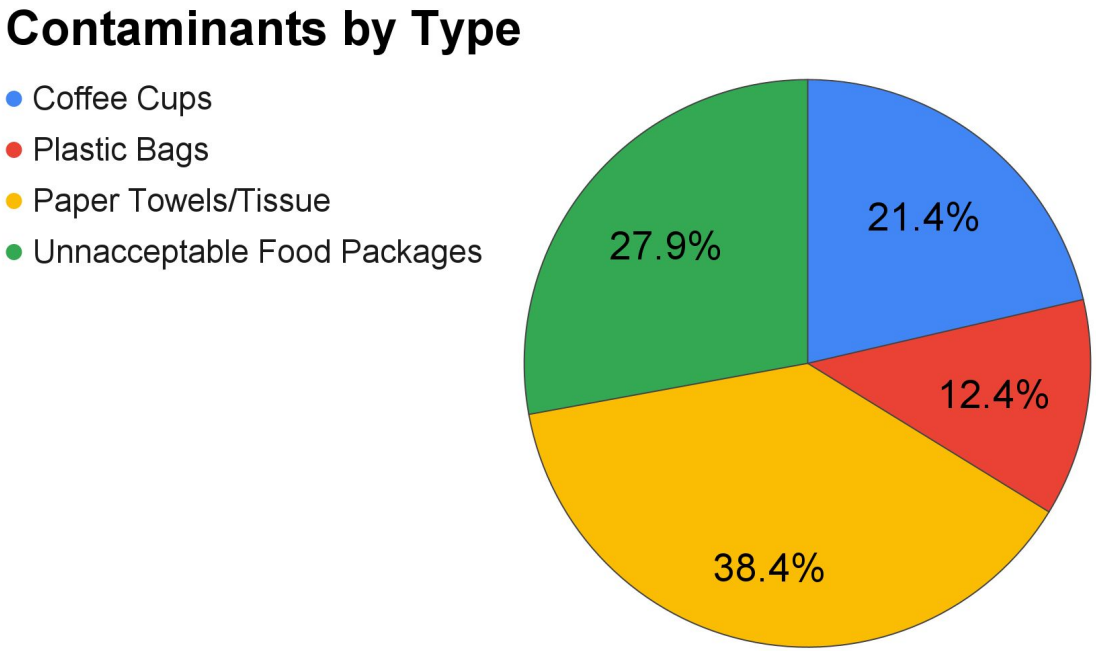
1. Dirty Recycling
2. Lost Recyclables
3. Decision anxiety
4. System breakdowns

Analysis from OCS Data

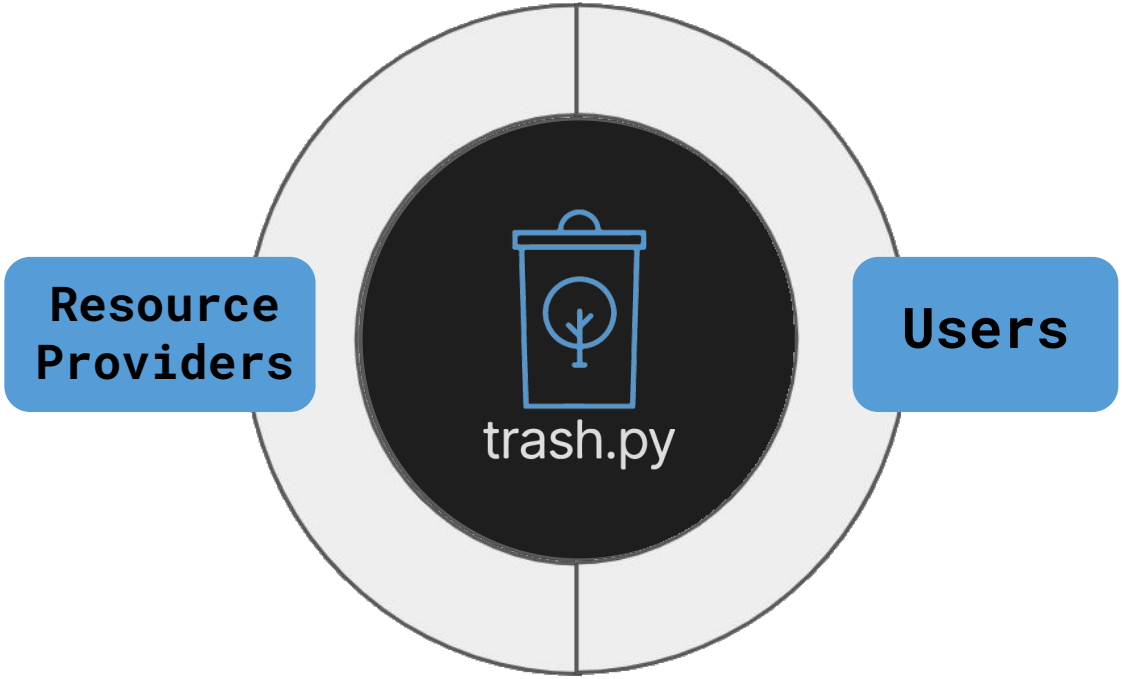
40%

of recyclables are **contaminated** on campus

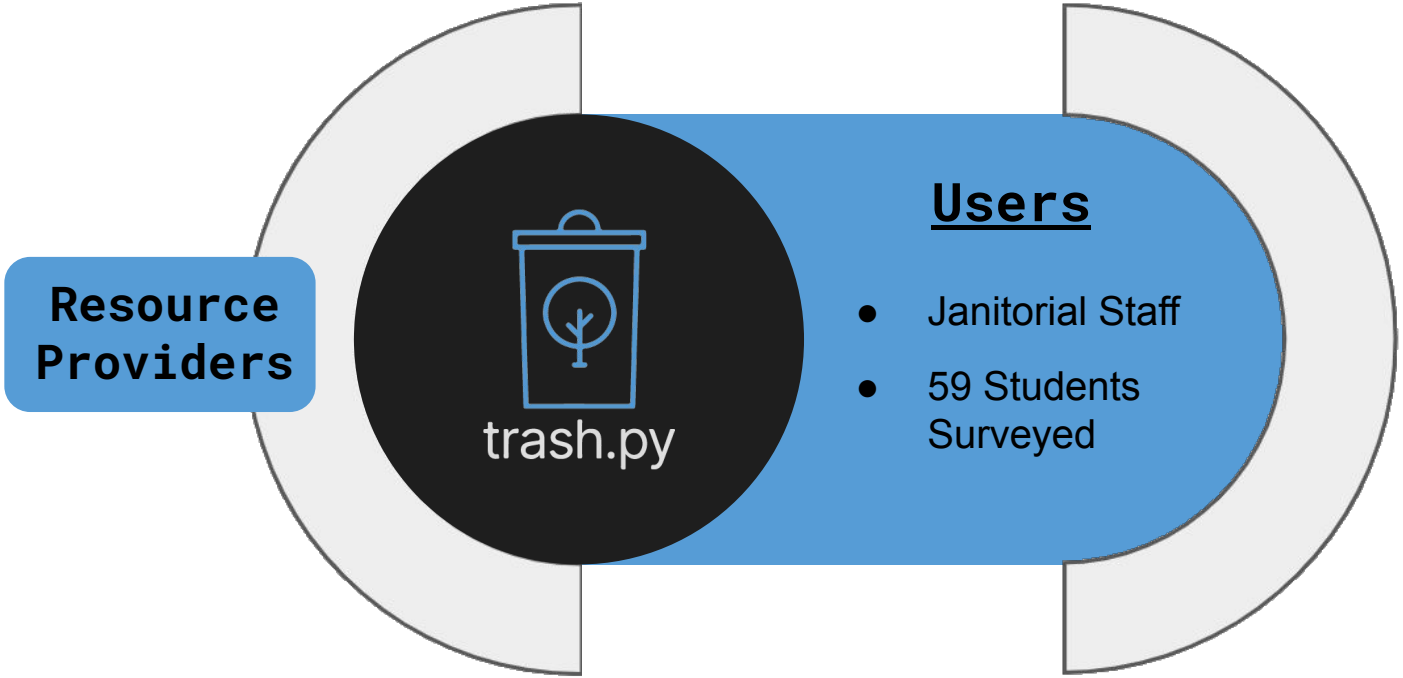
Analysis from OCS Data



Stakeholders



Stakeholders



Of students surveyed…

10%

feel **strongly confident** that they dispose waste in correct receptacles

Of students surveyed…

62%

say they use **other bin** if recyclable or landfill is overfull

Of students surveyed…

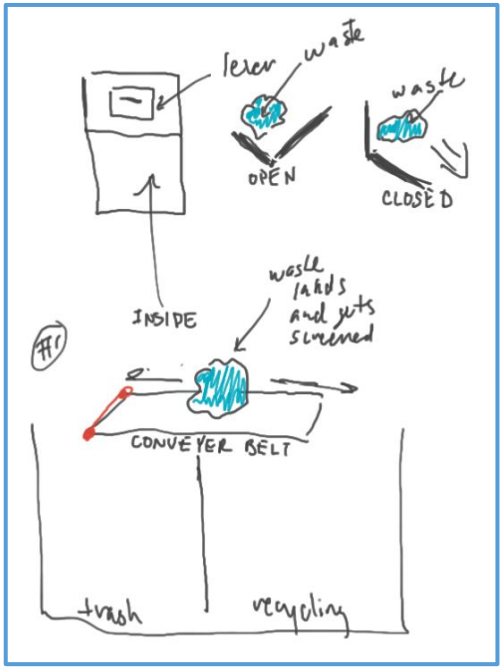
60%

are happy if they are **not expected to make any decisions** while disposing of waste

This is a problem

The Solution:

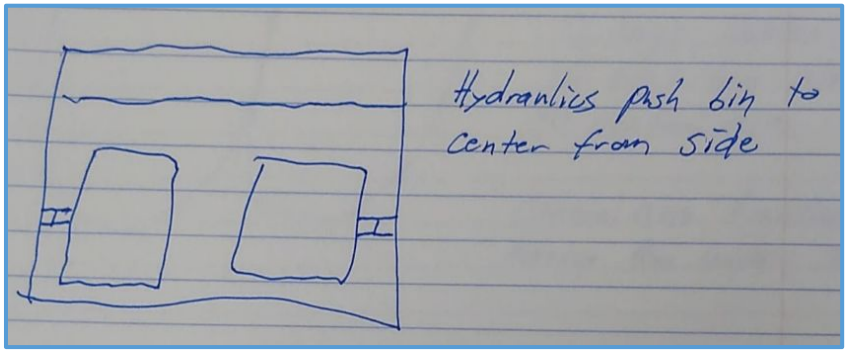
Brainstorming Design



Example concept #1

Brainstorming step	# ideas
Group/Individual Brainstorming:	44
Final Filter:	10

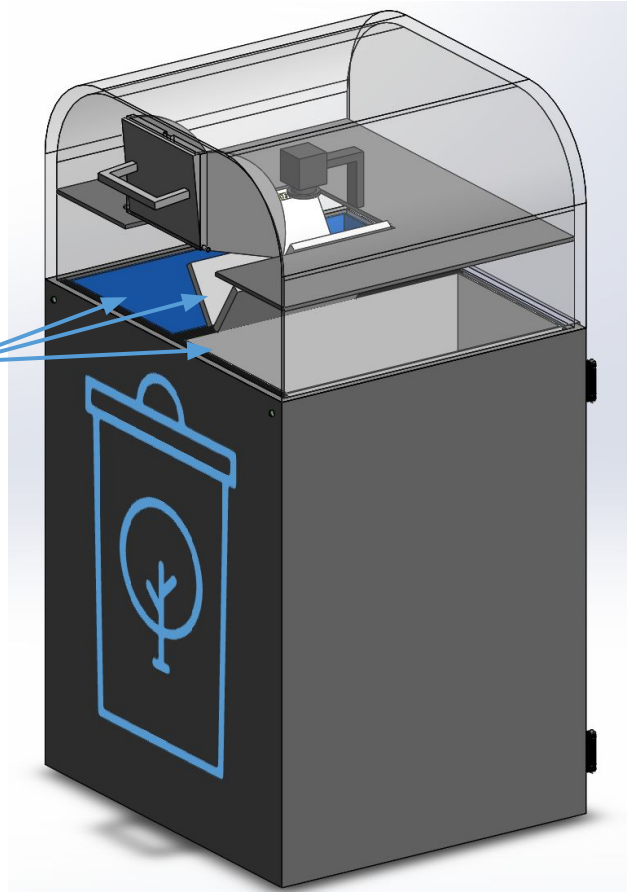
Example concept #2



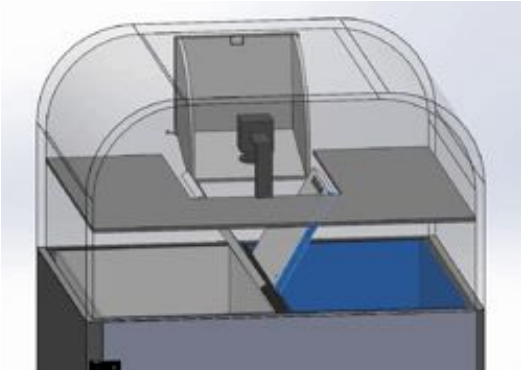
Our Design:

Current michigan plastic bins

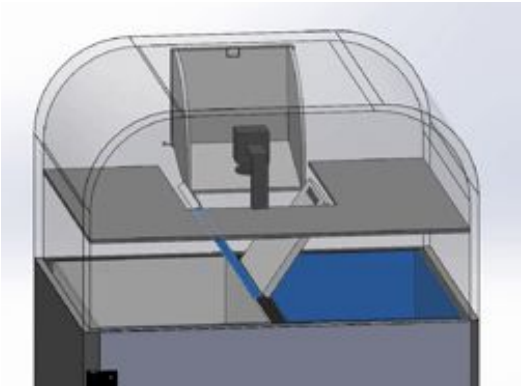
Staging Area



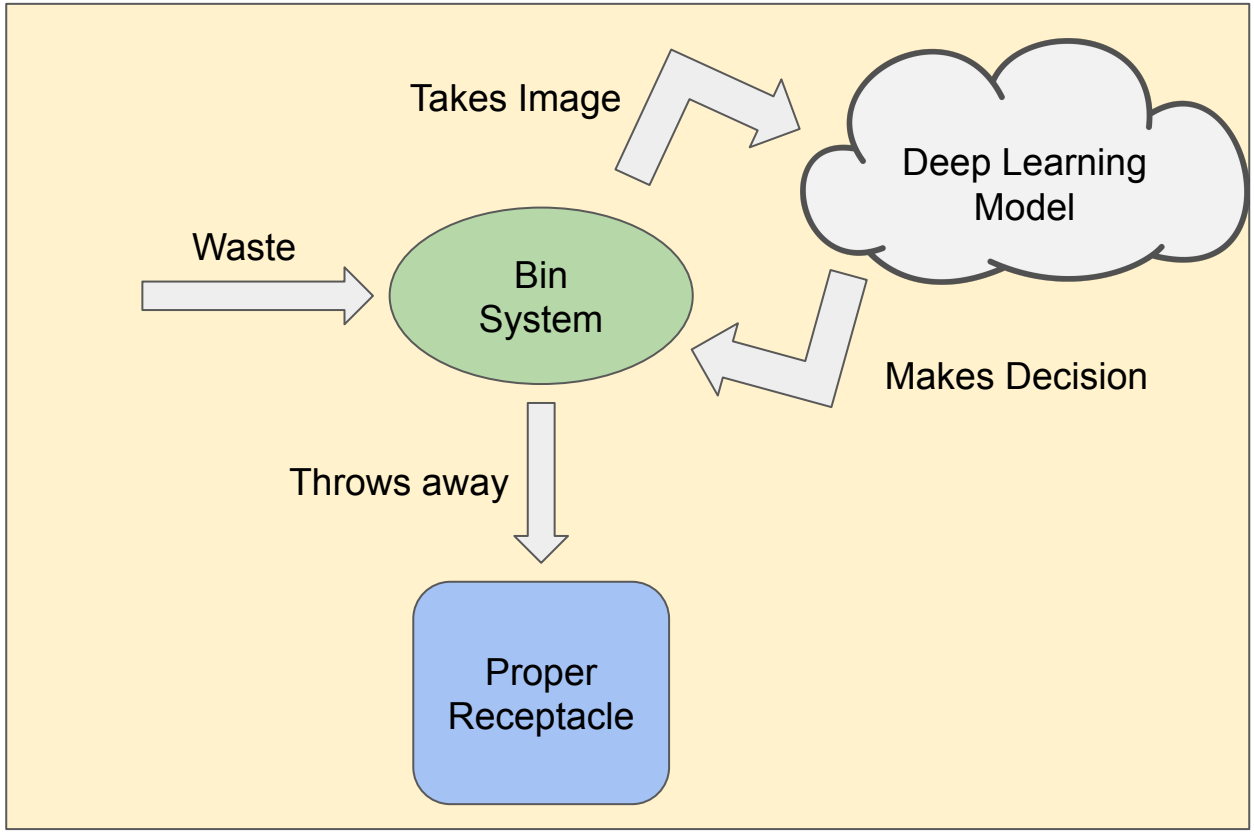
Case 1: Recycling



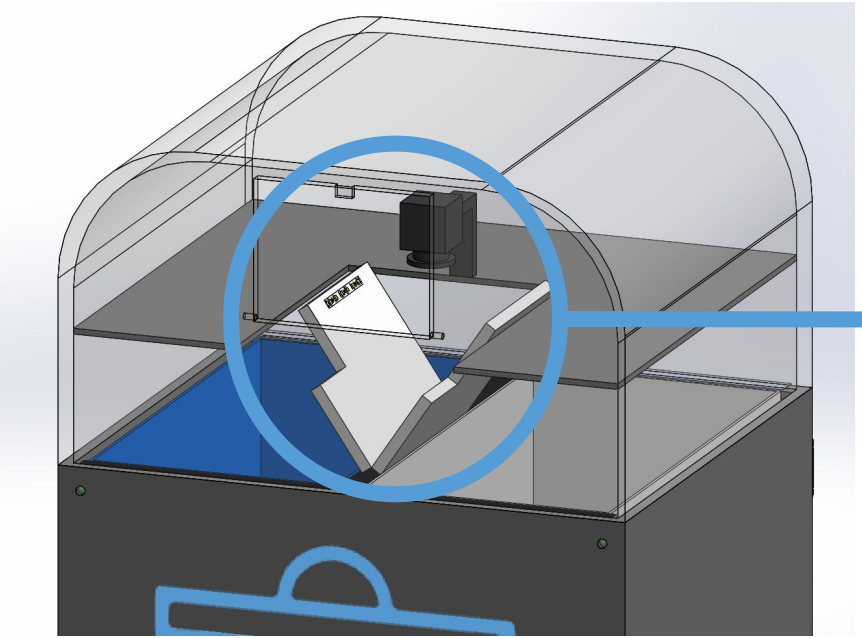
Case 2: Trash



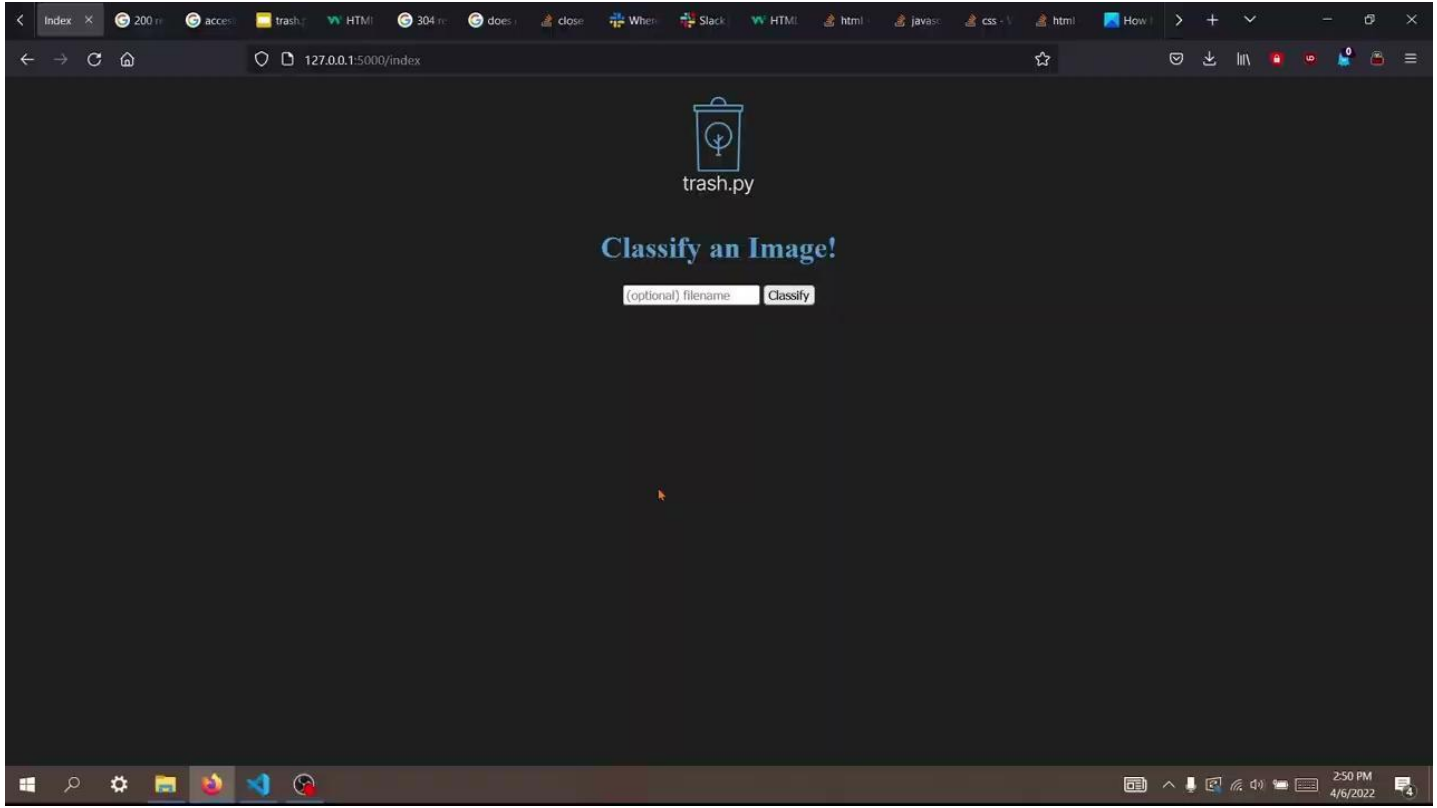
System Map


Takes Image
Deep Learning Model
Waste
Bin System
Makes Decision
Throws away
Proper Receptacle

Lo-fi Prototype



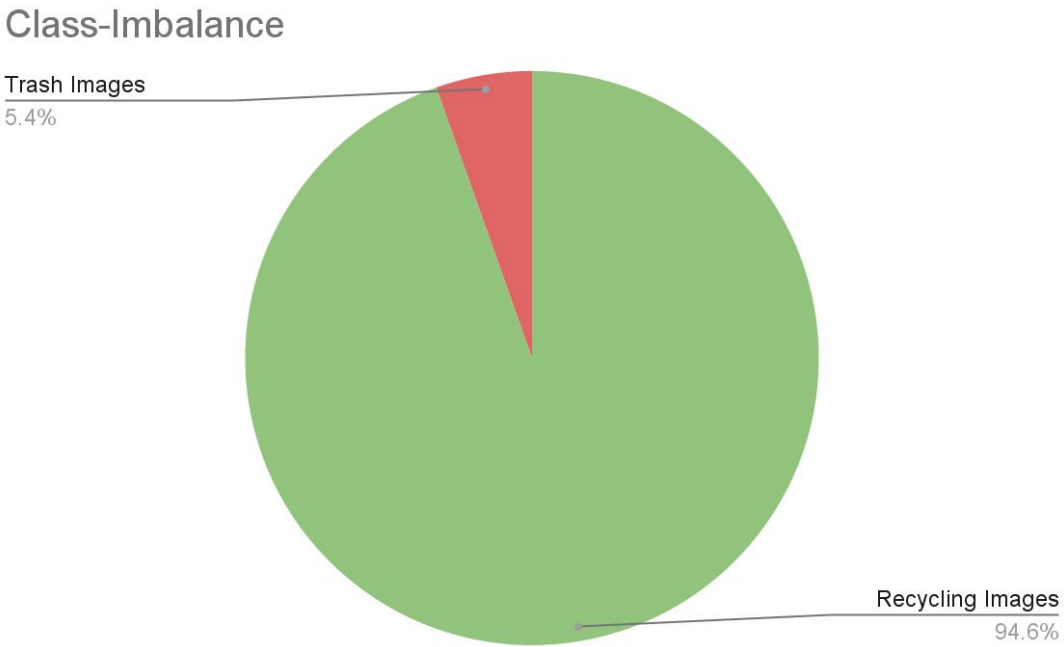
System Demonstration



The Data Set

- TrashNet Dataset
- Similar problem to ours
- Close images on white background
- Many recycling categories, only one trash category
- Results in class-imbalance

Challenges of Class-Imbalanced Data



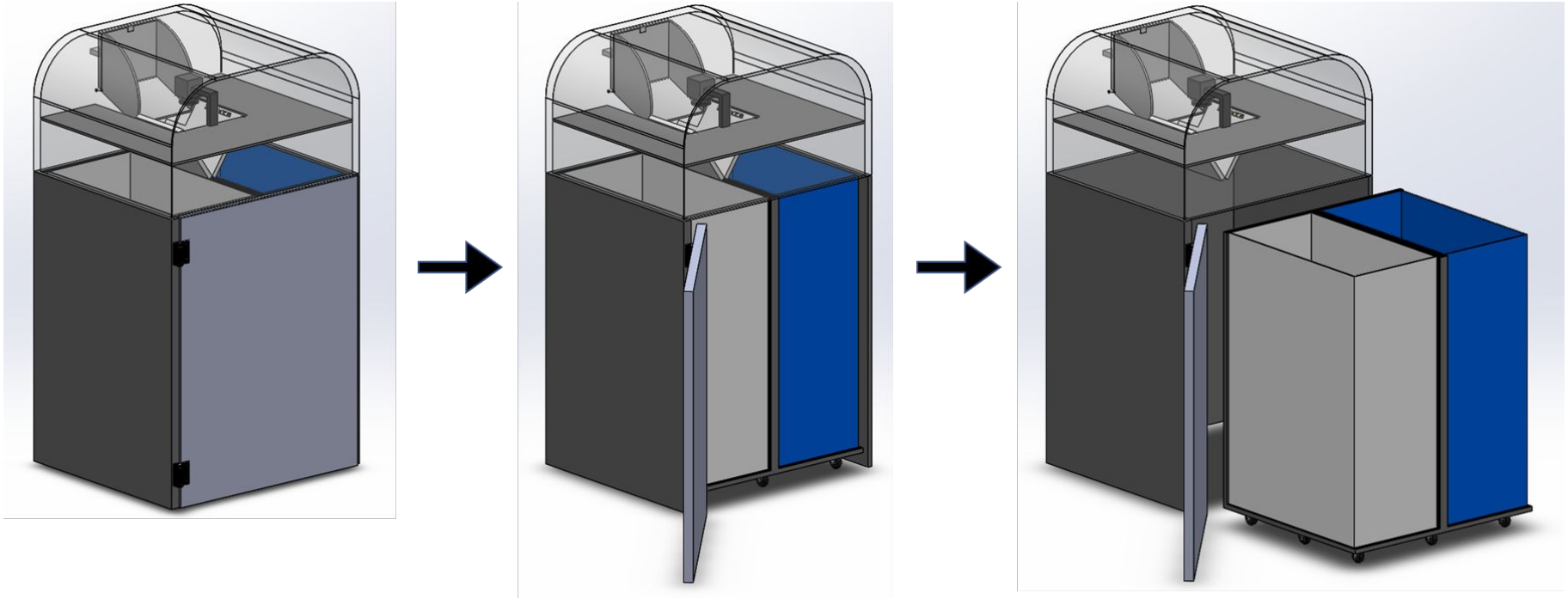
The model can cheat!

Solution: Create copies of trash data to increase percentage

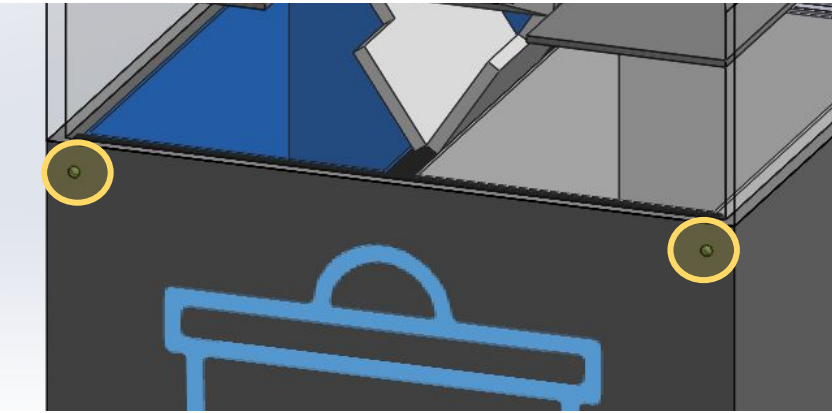
Pros: Better distribution, more data

Cons: Much longer training time

The Solution: Features

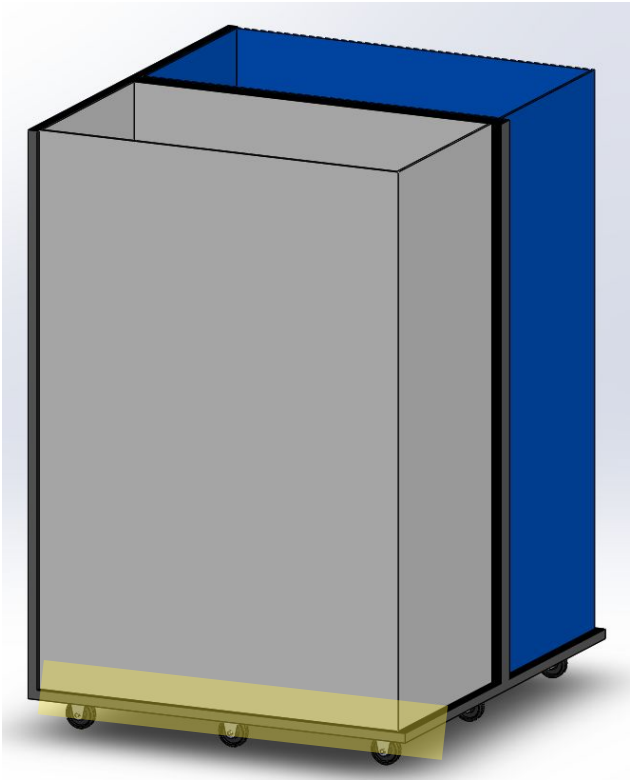


The Solution: Features



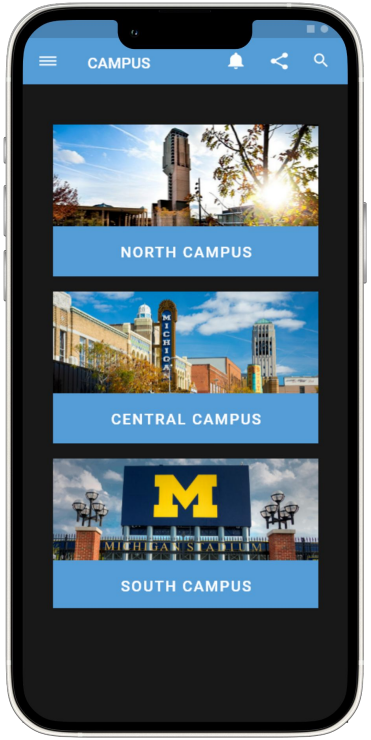
LED lights on corner of bin

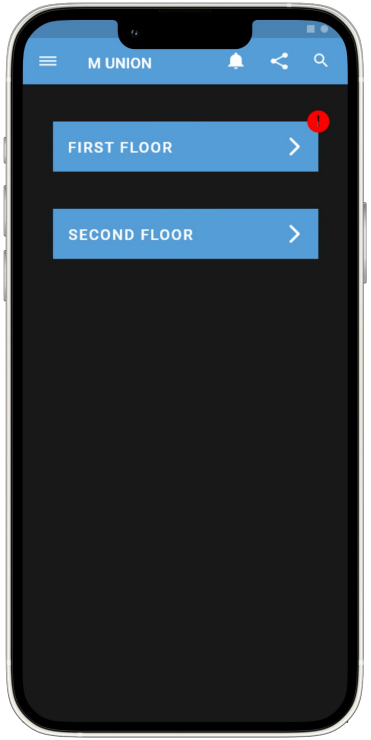
- Green: Working properly
- Orange: Full bin
- Red: Not working / need Maintenance



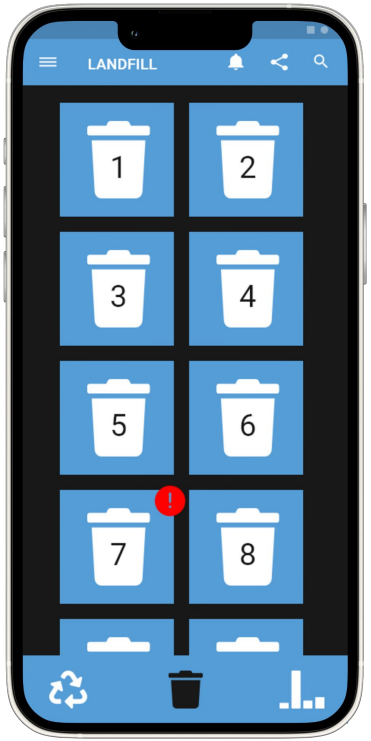
Weight Sensor:
Detects when respective bin is full

The Solution: Features





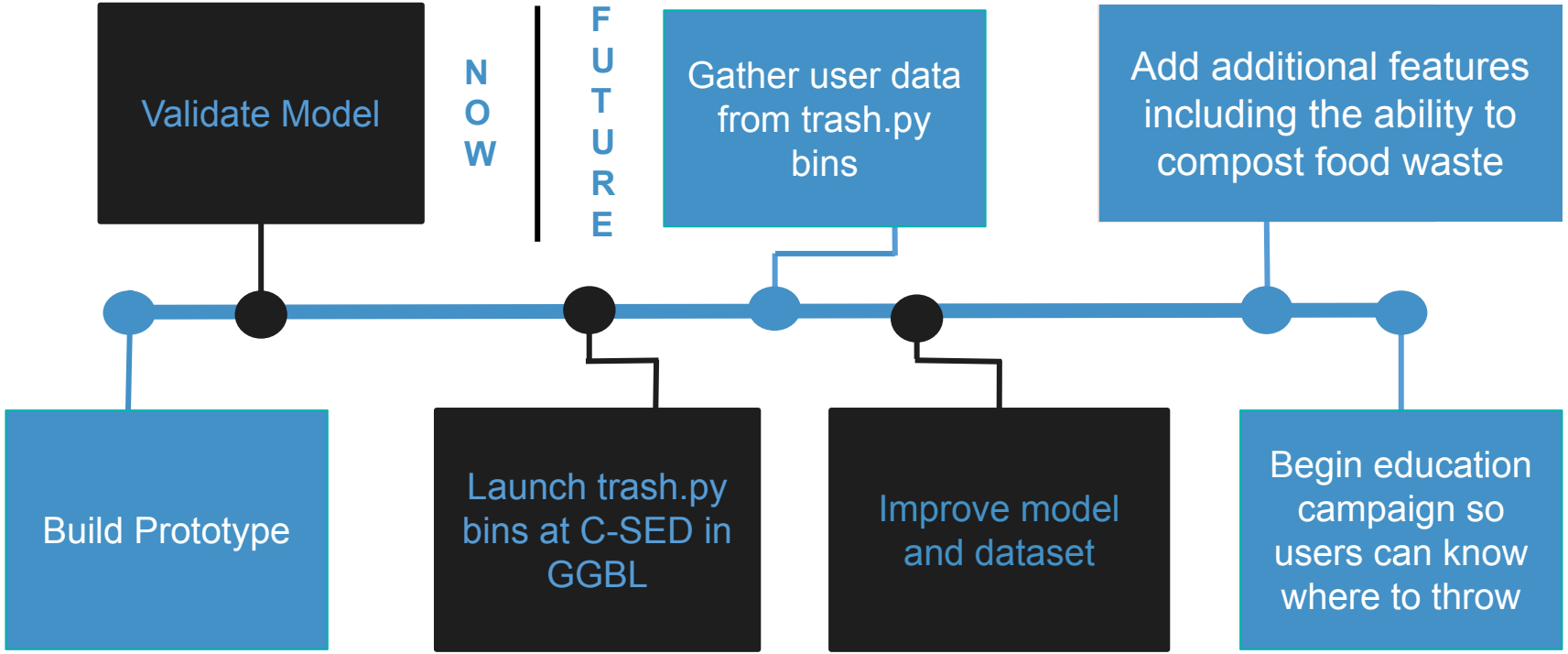
The Solution: Features



Current Market

	trash.py		Bin-e	smartbin.io
Reduced Contamination	✓	✗	✓	✗
Reduced Decisions	✓	✗	✓	✗
Small Physical Footprint	✓	✓	✗	✓
Easy adoption for UofM	✓	✓	✗	✗

Project Timeline



Thank You

trash.py

Key sustainability drivers

Reducing lost recyclables

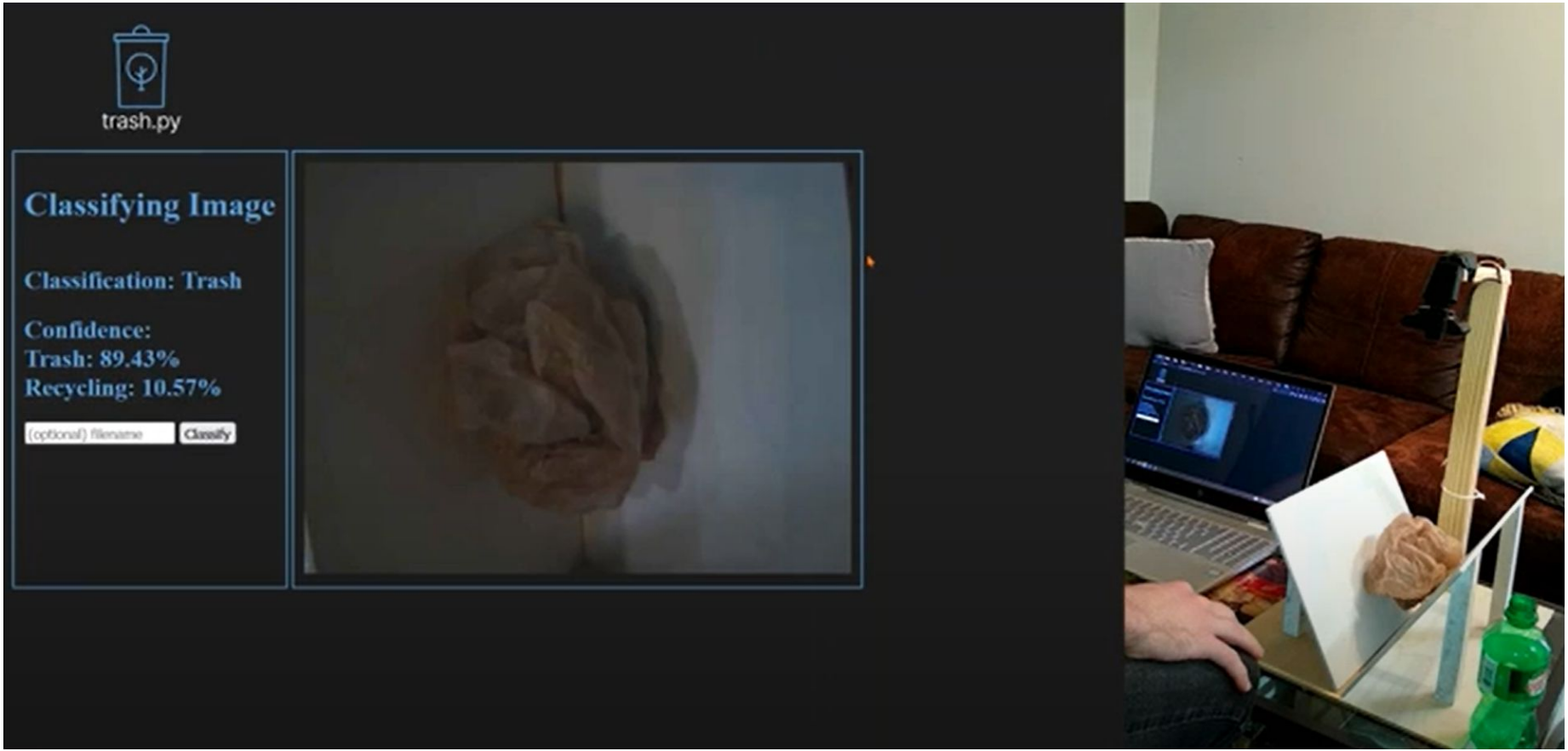
Improving user’s experience

Reduce MRF strain

Key Partnerships

1. Office of Campus Sustainability
2. Janitorial Staff

FACILITIES & OPERATIONS
OFFICE OF CAMPUS SUSTAINABILITY
UNIVERSITY OF MICHIGAN


trash.py
Classifying Image
Classification: Trash
Confidence:
Trash: 89.43%
Recycling: 10.57%
(optional) filename
Classify

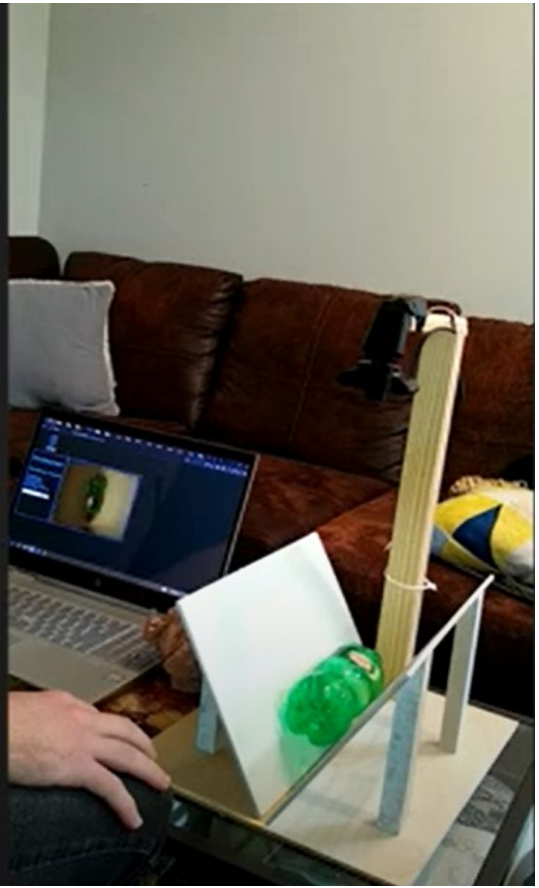
trash.py

Classifying Image

Classification: Recycling

Confidence:
Trash: 5.51%
Recycling: 94.49%

(optional) filename | Classify



PAPER
CLEAN, EMPTY
DRINK CARTONS
FOOD SCRAPS
COMPOSTING LOWERS
YOUR CARBON FOOTPRINT
PLASTIC BAGS
RECYCLE
COMPOST
LANDFILL

EVO
ECO

Future Ideas

- Compost
- Education
- Game
- Expansion outside university

Value Proposition

Reduce Waste

Build positive environmental impact