BAGBOYS

AI Based Household Trash Bags Collection System

Team & Participating companies

우송대학교 WOOSONG UNIVERSITY

Woosong University

Netvision telecom

(주)넷비젼텔레콤

Agenda

1. Problem
2. Our Solution
3. AI Model
4. Backend
5. Frontend
6. Results
7. Challenges
8. Demo

Problem

- LARGE NUMBER OF COMPLAINTS FROM RESIDENTS
- UNCOLLECTED TRASH BAGS

TRASH BAGS THAT IS NOT COLLECTED PROPERLY AND ON TIME

- ILLEGAL TRASH PROBLEM

COLLECTING OTHER TRASH BAGS EXCEPT FOR PAID-BAG (RECYCLING, FOOD GARBAGE, GUNNY, NON-COMPLIANT, OTHER)

- INCONVENIANT SMELL FOR RESIDENTS

INCONVENIENCE TO NEARBY RESIDENTS DUE TO UNCOLLECTED TRASH BAGS

Our Solution

Response	Location
1 Gunnysack	대전 동구 용운동 685
1 Gunnysack	대전 동구 자양동 52-2
1 Gunnysack	대전 동구 자양동 52-2
1 Food-garbage	대전 동구 용운동 685
10 Gunnysack	대전 동구 자양동 52-2

Classify Types of Trashbags

Locate the data of trashbags

Save Data and location information

AI Model

DATASET

- Images of Trashbags
- JPG format
- Images per class
- Mixed Images

YOLO DATASET

- Labeled Images
- Yolo zip Format

(Images.jpg & Label.txt format)

MVP MODEL

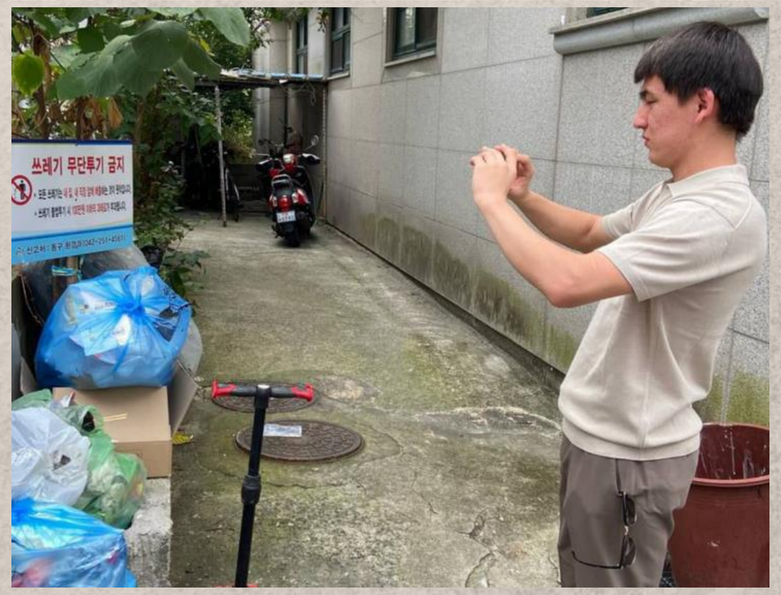
- Try one trashtype
- Try Different Models

LAST MODEL

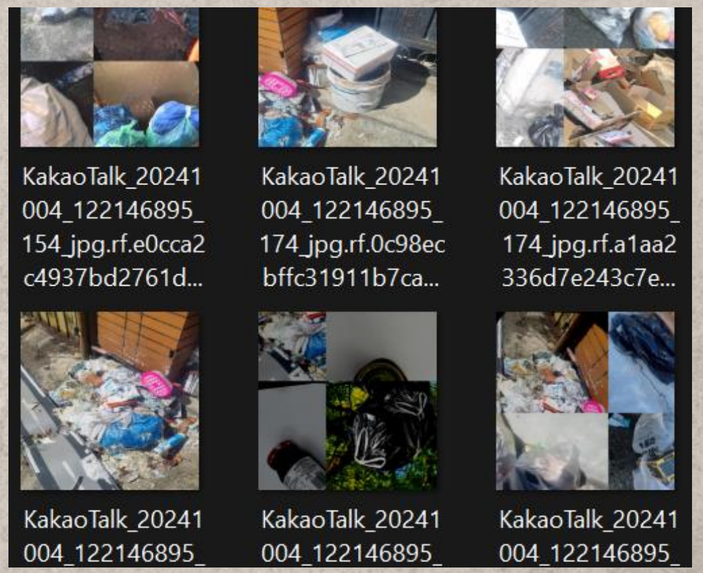
- All Trashbags included
- Adjust Hyperparameters (epochs, learning rate...)
- Choose the best

AI Model: Dataset

- JPG Format
- Each team member - every trashbag type
- Everyone - All trashbags included photos
- Google Drive

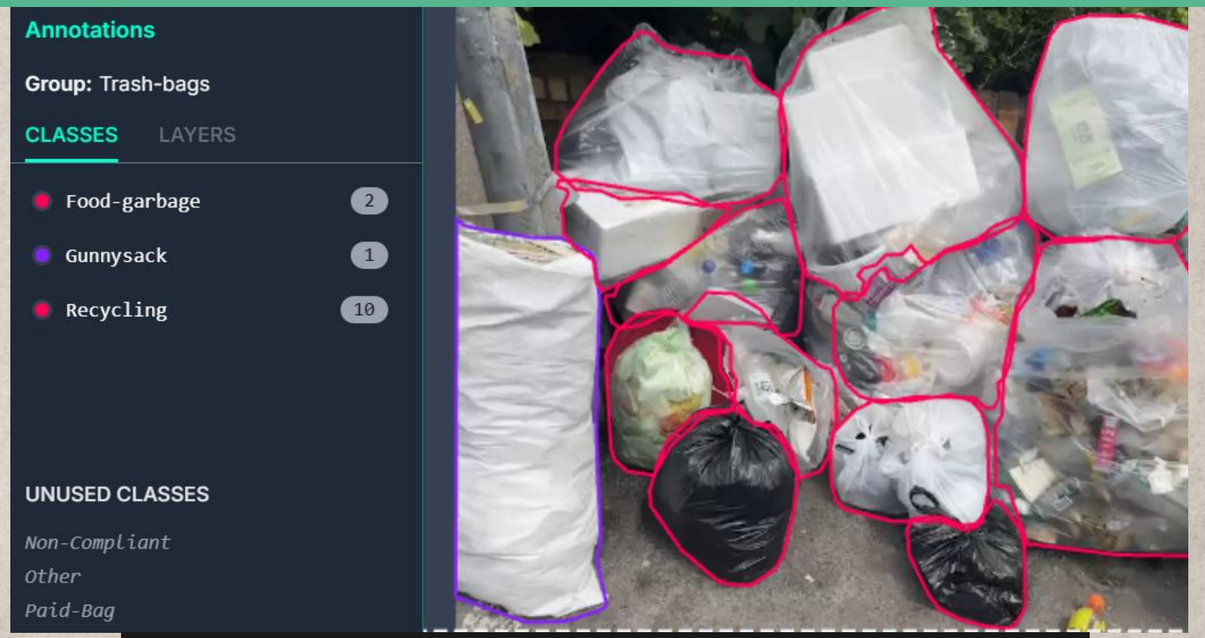


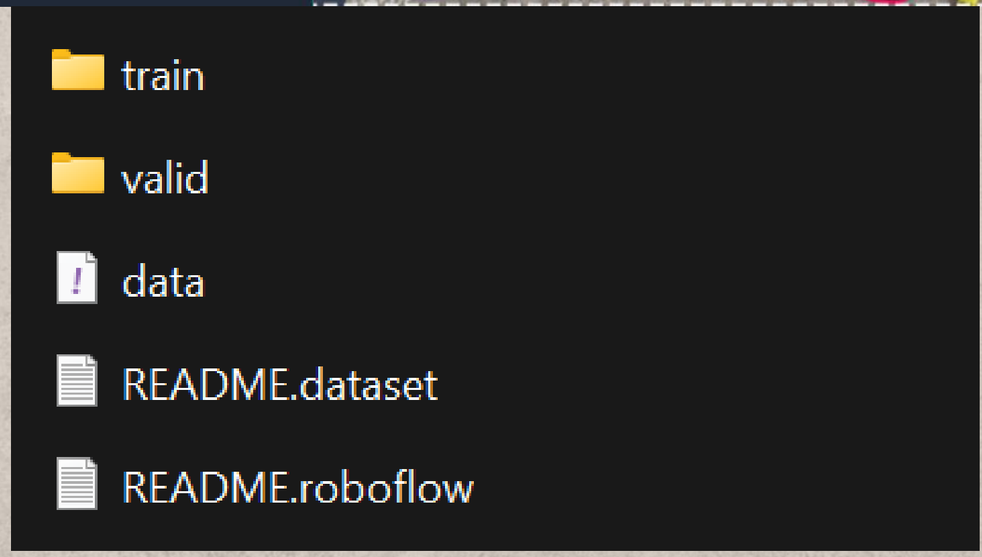
Class	Images
Paid-Bag	5432
Recycling	5100
Non-Compliant	9410
Food-garbage	5630
Other	8950
Gunnysack	5228



AI Model: YOLO Dataset

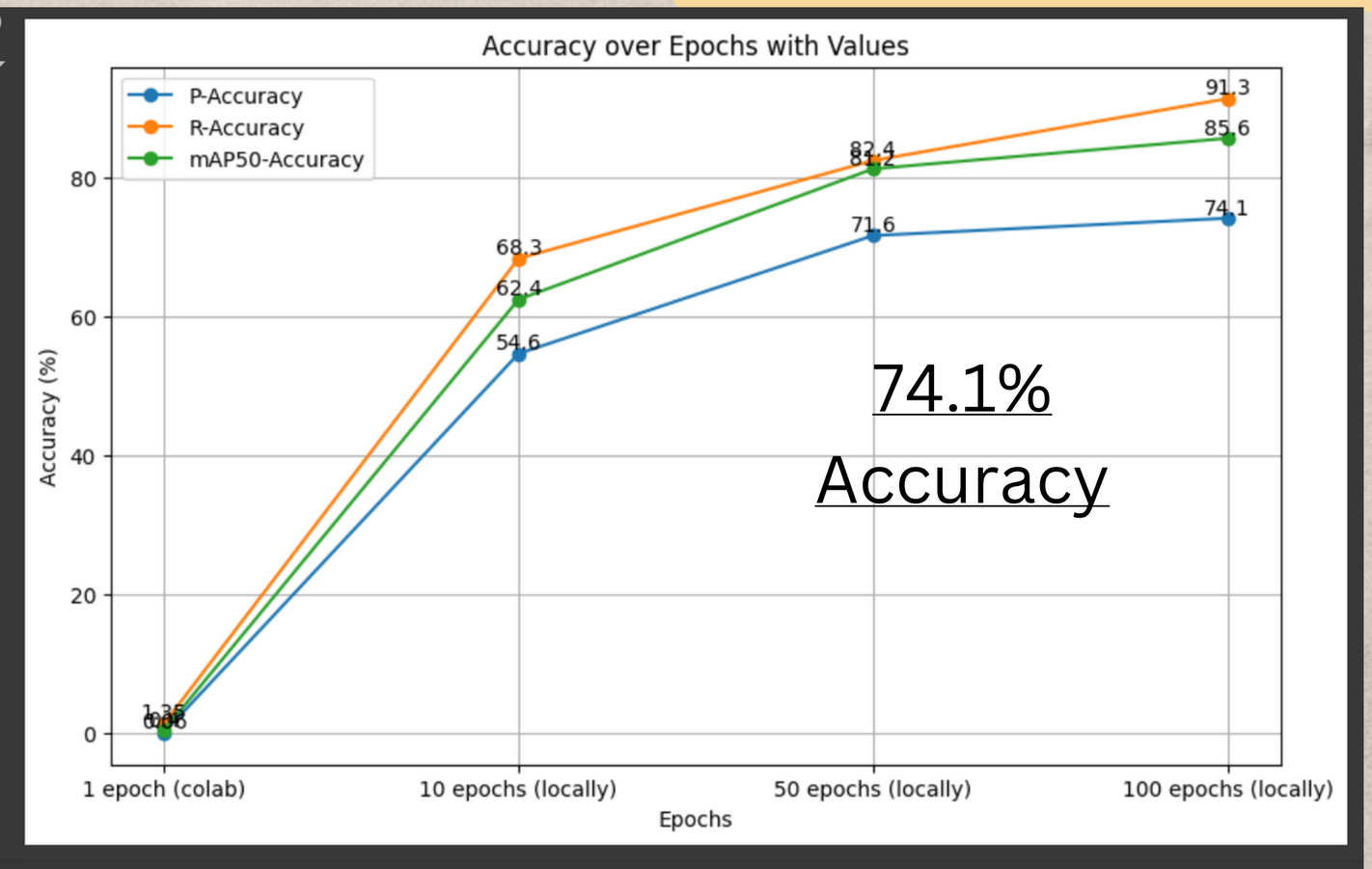
- Labeled Manually (Roboflow)
- Downloaded in YOLO zip format

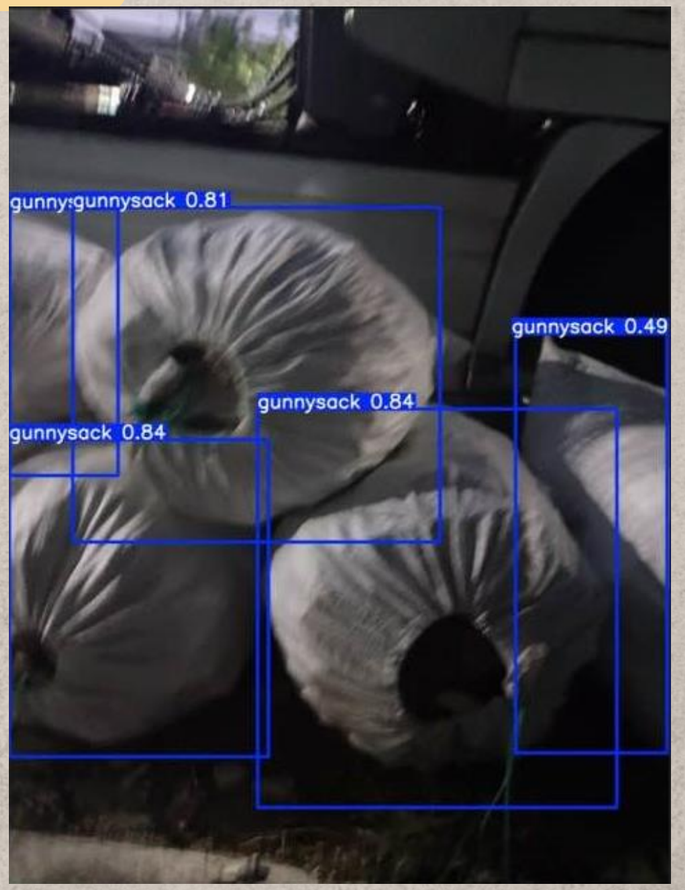




AI Model: MVP Model

- Gunnysack Trashbag type
- YOLOv8 Model (100 epochs)





AI Model: Last Model

- All Trashbag Types
- YOLOv11 Model

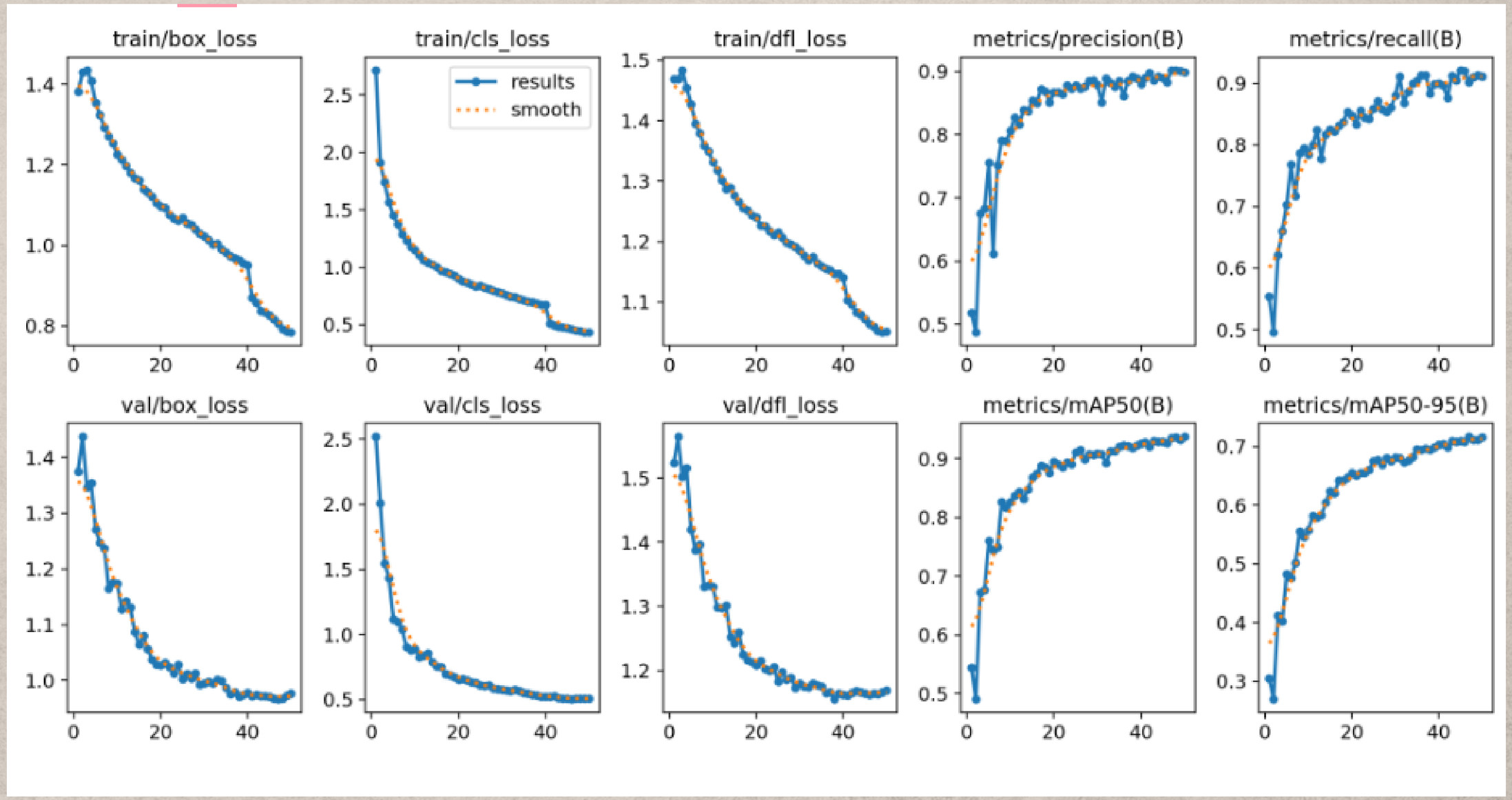
```
200 epochs completed in 49.433 hours.
Optimizer stripped from D:\capstone\trashbagdataset\runs\detect\train3\w
Optimizer stripped from D:\capstone\trashbagdataset\runs\detect\train3\w

Validating D:\capstone\trashbagdataset\runs\detect\train3\weights\best.p
Fusing layers...
Model summary: 157 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs

Class            Images    Instances    P       R       mAP50    mAP50-95
-------------------------------------------------------------------------
Paid-Bag         5432      16839        0.945   0.860   0.890    0.740
Recycling        5100      15810        0.900   0.870   0.910    0.750
Non-Compliant    9410      29171        0.890   0.880   0.930    0.770
Food-garbage     5630      17453        0.915   0.850   0.870    0.720
Other            8950      27745        0.872   0.830   0.840    0.700
Gunnysack        5228      16206        0.930   0.800   0.830    0.690

-------------------------------------------------------------------------
Average          39750     123224       0.909   0.848   0.878    0.728
```

AI Model: Last Model



Backend

Trashes in the streets

Phone Takes a photo

Trash Location

Backend Server

Trash Monitoring Website

HTTP Req

HTTP Res

Save Output

AI model detects & counts different trash bags

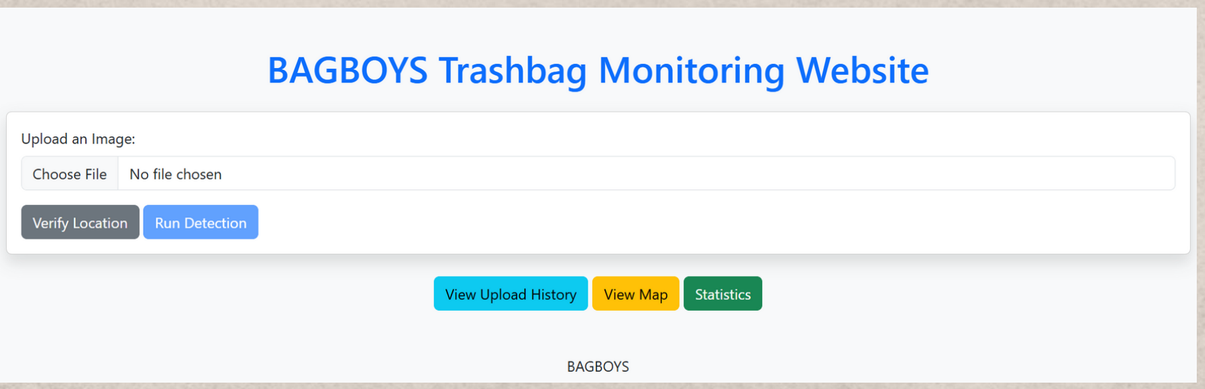
Database

Data Storage

- SQL Lite
- Output from Model (Trash type, Number of bags, Location, Time)

Front End

Dashboard Website

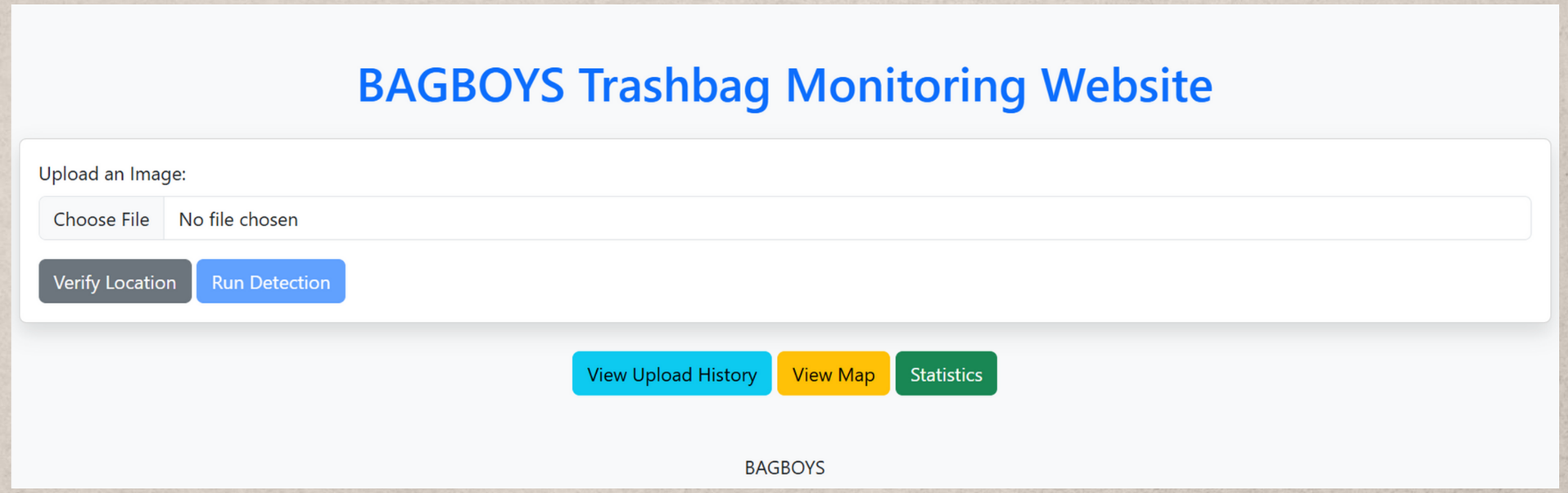


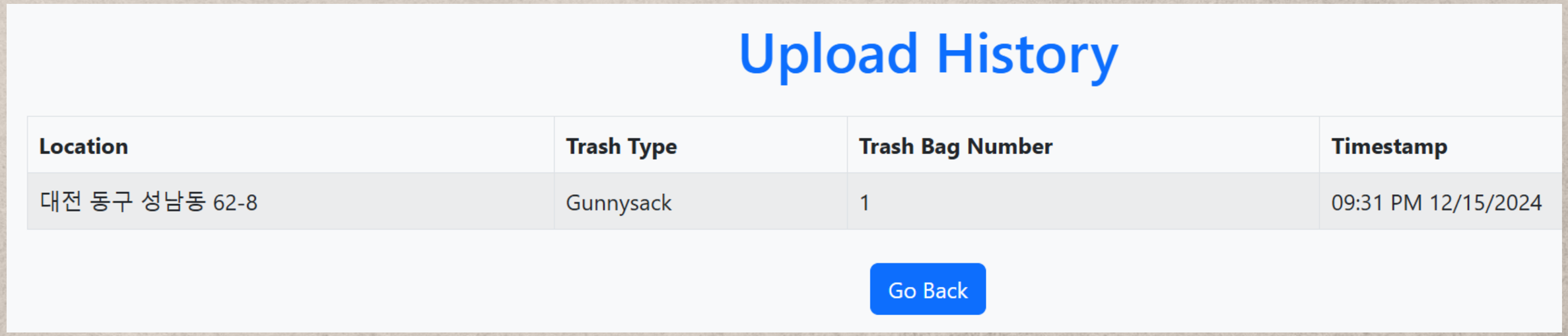
- HTML CSS
- 4 Pages

Mobile App

- Java
- 1 Page
- Photo uploading function

Front End: Dashboard website





Front End: Dashboard website

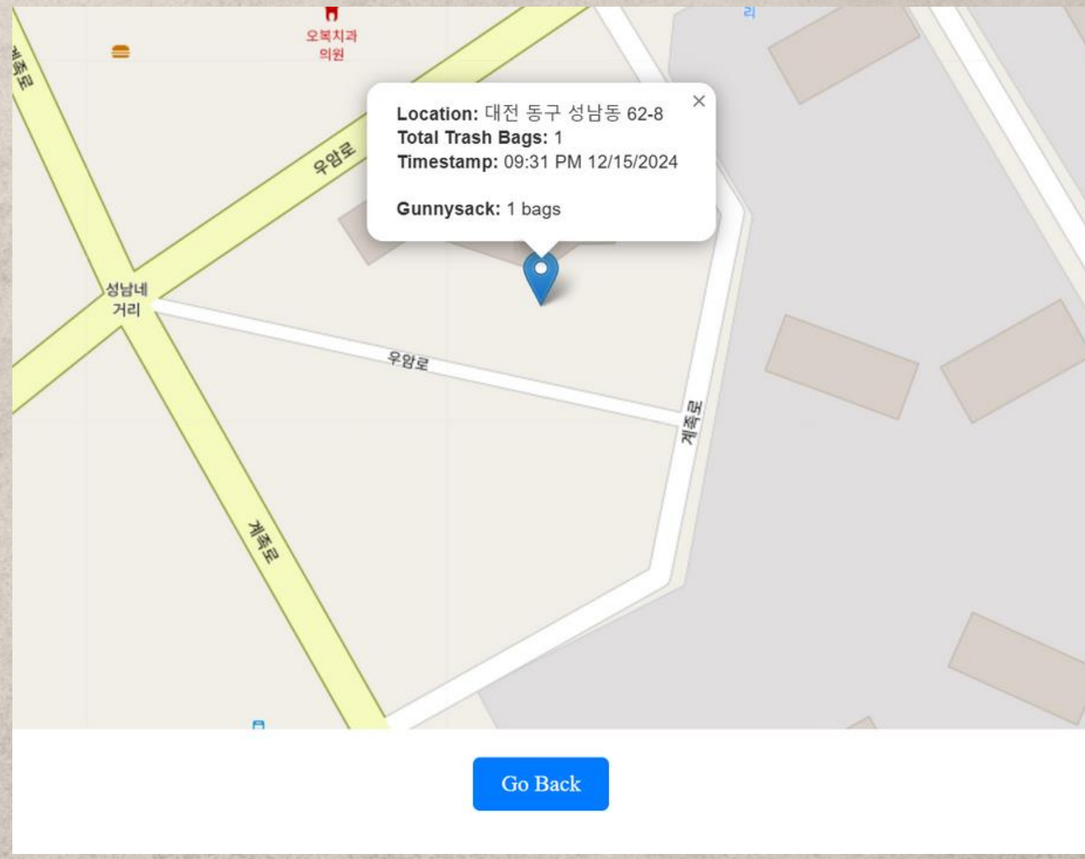
Statistics

Filter by Trash Type

Food-garbage Gunnysack Non-Compliant Other Paid-Bag Recycling

Search Clear Filters

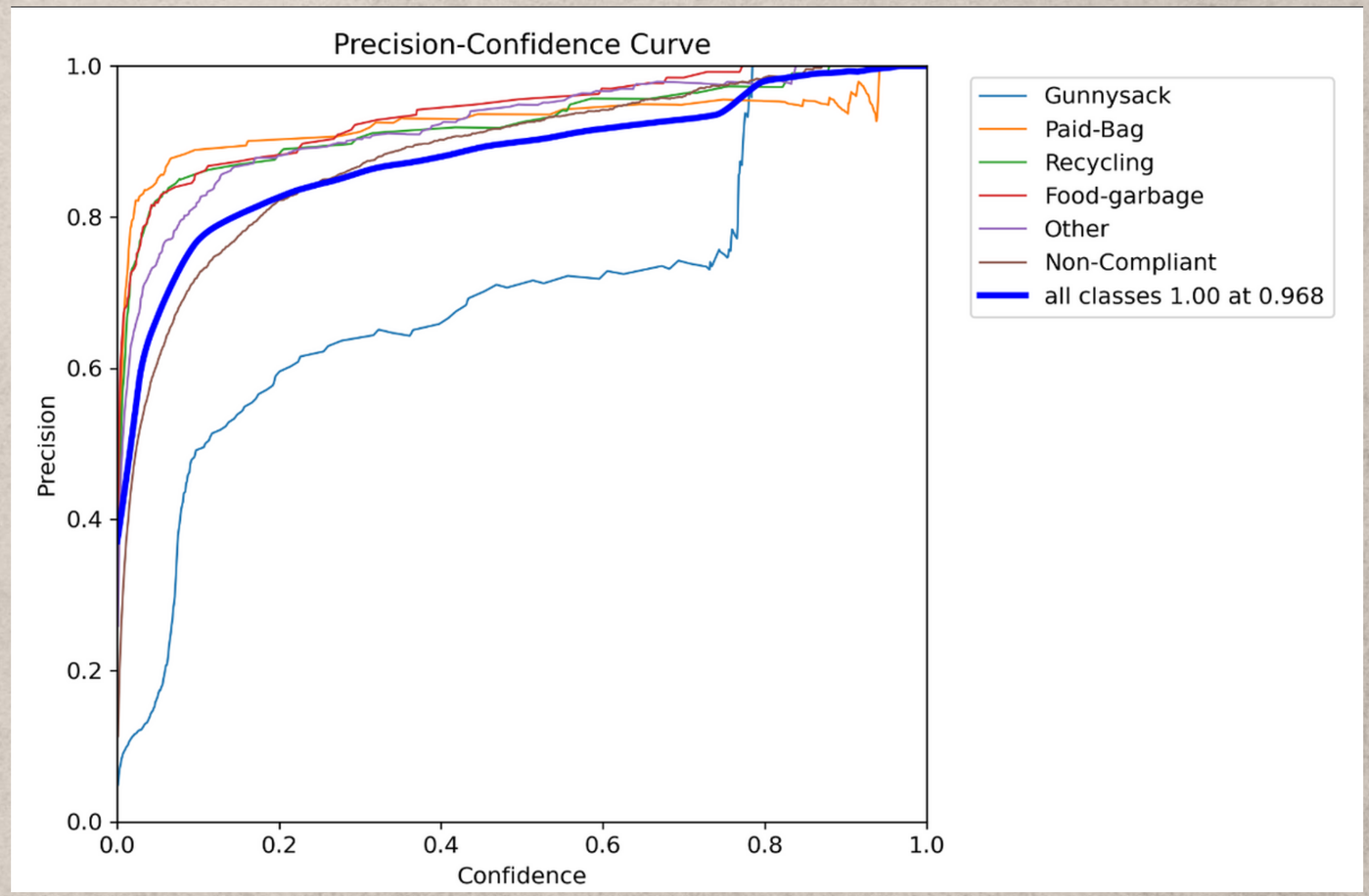
Location	Trash Type	Number of Bags	Timestamp
대전 동구 자양동 155-3	Paid-Bag	3	06:58 PM 12/07/2024
대전 동구 자양동 155-3	Gunnysack	6	06:58 PM 12/07/2024
대전 동구 자양동 155-3	Recycling	20	06:58 PM 12/07/2024
대전 동구 자양동 155-3	Recycling	4	06:59 PM 12/07/2024
대전 중구 중촌동 144	Paid-Bag	4	01:38 PM 12/11/2024
대전 중구 중촌동 144	Recycling	2	01:38 PM 12/11/2024
대전 동구 자양동 52-2	Recycling	6	04:14 PM 12/11/2024
대전 동구 자양동 52-2	Paid-Bag	1	04:14 PM 12/11/2024



Go Back

Results

Trashbag	Accuracy
Paid-Bag	0.945
Recycling	0.900
Non-Compliant	0.890
Food-garbage	0.915
Other	0.872
Gunnysack	0.930



Results

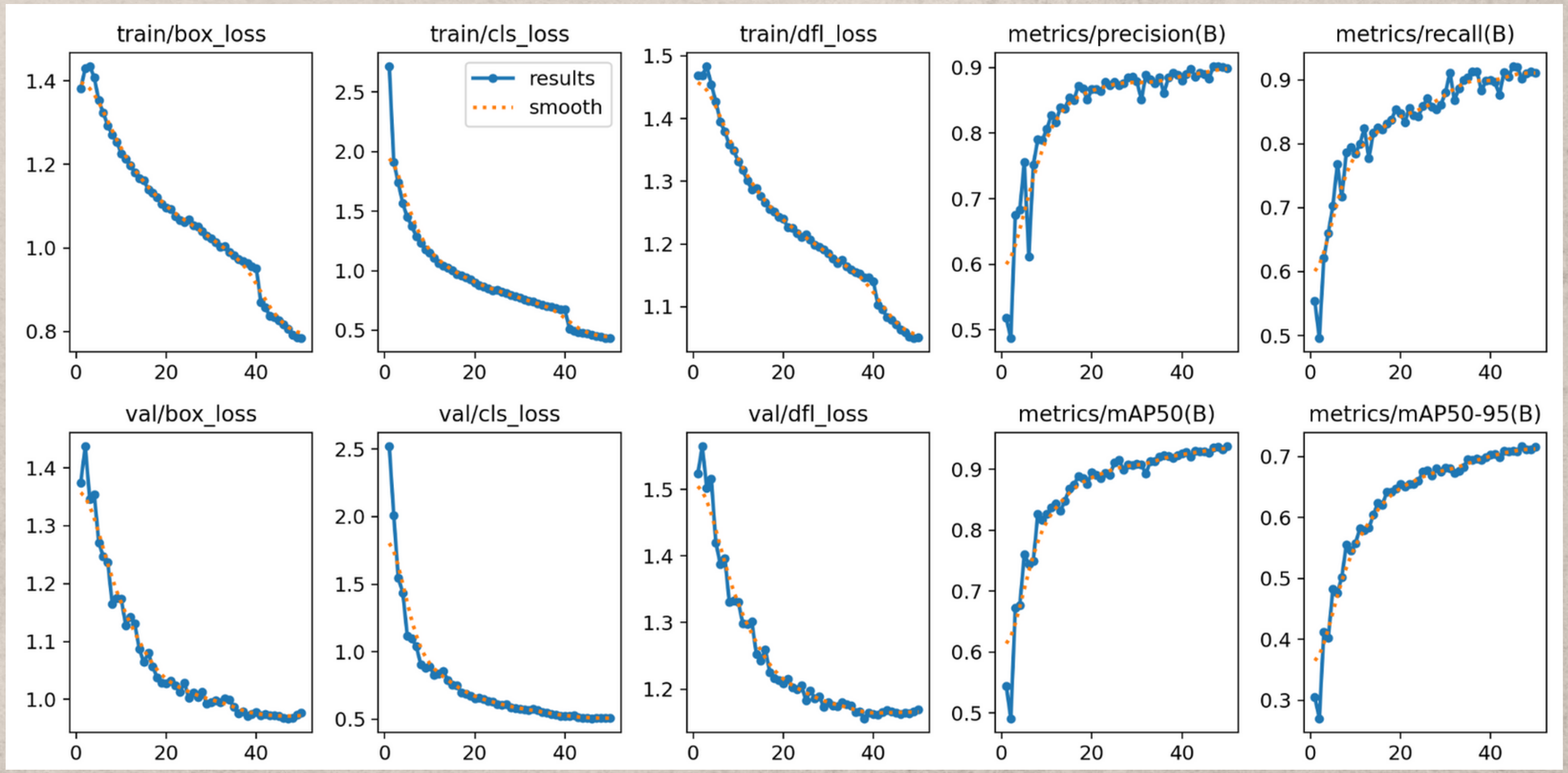
```
200 epochs completed in 49.433 hours.
Optimizer stripped from D:\capstone\trashbagdataset\runs\detect\train3\w
Optimizer stripped from D:\capstone\trashbagdataset\runs\detect\train3\w

Validating D:\capstone\trashbagdataset\runs\detect\train3\weights\best.p
Fusing layers...
Model summary: 157 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs

Class              Images   Instances   P      R      mAP50   mAP50-95
-------------------------------------------------------------------
Paid-Bag           5432     16839       0.945  0.860  0.890   0.740
Recycling          5100     15810       0.900  0.870  0.910   0.750
Non-Compliant      9410     29171       0.890  0.880  0.930   0.770
Food-garbage       5630     17453       0.915  0.850  0.870   0.720
Other              8950     27745       0.872  0.830  0.840   0.700
Gunnysack          5228     16206       0.930  0.800  0.830   0.690

-------------------------------------------------------------------
Average            39750    123224      0.909  0.848  0.878   0.728
```

Results


train/box_loss
train/cls_loss
results
smooth
train/dfl_loss
metrics/precision(B)
metrics/recall(B)
val/box_loss
val/cls_loss
val/dfl_loss
metrics/mAP50(B)
metrics/mAP50-95(B)

Challenges

- Different image file types (jpg, png, heic...)
- Labeling Time Complexity
- Low accuracy (low amount of images)

Solutions

- Python Programm to change file types
- Divided task to every team member
- Exchanged dataset with another team
- Downloaded free sourced images for other, non compliant

Demo

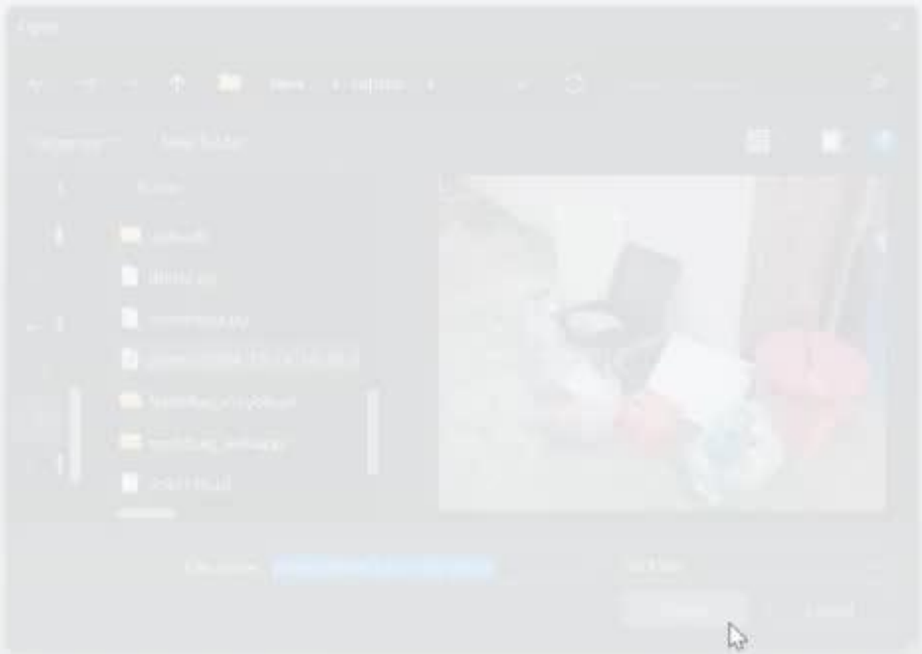
BAGBOYS Trashbag Monitoring Website

Upload an Image:

Choose File | No file chosen

Verify Location | Run Detection

View Upload History | View Map | Statistics



BAGBOYS