垃圾辨識系統:
應用於環境保護和可持續發展

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Problem statement

在當今社會中，垃圾管理和環境保護變得越來越重要。期望設計一個基於深度學習技術的垃圾辨識系統，旨在提高垃圾分類的效率，促進資源回收，以實現更可持續的環境發展。

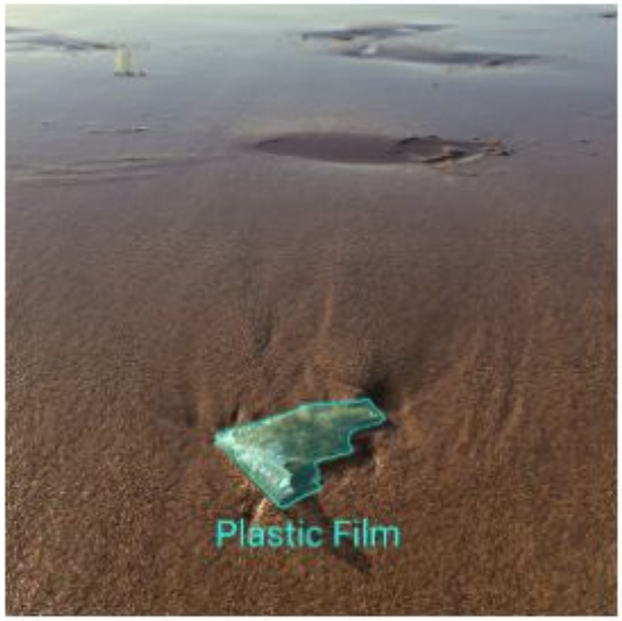
Methodology

1. 影像處理

2. TensorFlow Protobuf
   重建 TensorFlow 模型、物體檢測

3. PIL
   讀取圖像文件

4. Classification
   回收分類



Dataset employed

TACO

🌮 關於野生垃圾的open image dataset，環境從海灘到街景

Contents

Official: 1500 images

Unofficial: 3746 images

Labels: 60 categories

Trained Models

Framework

- SSD MobileNet v2
- TensorRT 6
- trained with 100,000 steps.

Contents

- UFF file (.uff)
- TensorFlow frozen graph (.pb)
- TensorRT engine (.engine)

不可回收項目 (一般垃圾)

4: Carded blister pack

19: Meal carton

20: Pizza box

21: Paper cup

23: Foam cup

26: Food waste

32: Tissues

33: Wrapping paper

37: Plastic film

38: Six pack rings

39: Garbage bag

40: Other plastic wrapper

41: Single-use carrier bag

42: Polypropylene bag

43: Crisp packet

44: Spread tub

46: Disposable food container

49: Plastic gloves

50: Plastic utensils

52: Rope & strings

56: Plastic straw

57: Paper straw

59: Unlabeled litter

60: Cigarette

(57: Paper straw)

(4: Carded blister pack)

(19: Meal carton)

(21: Paper cup)

(33: Wrapping paper)

可回收項目 (資源回收)

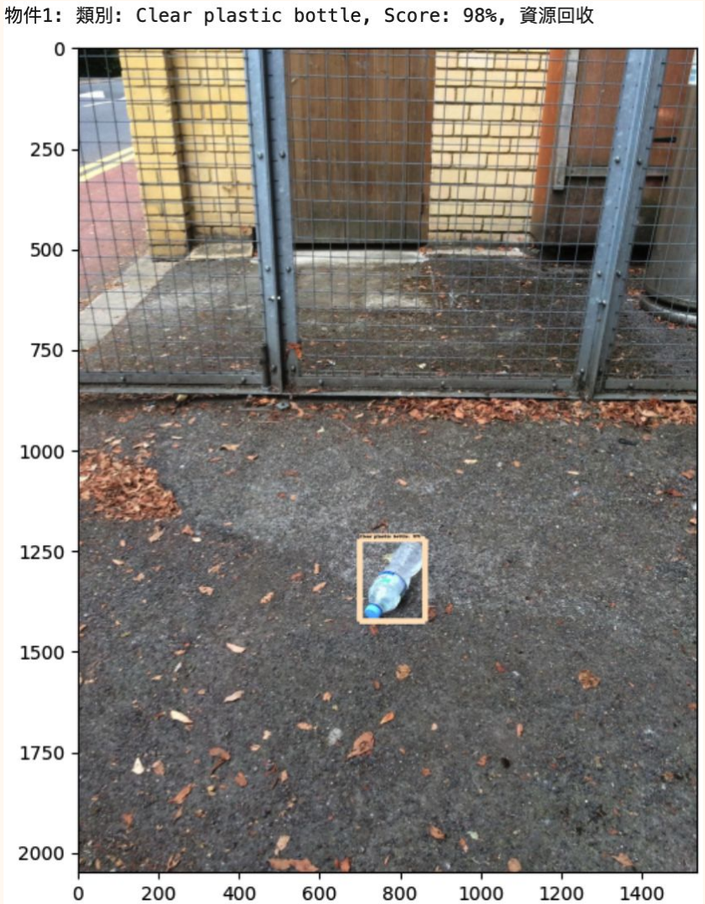
1: Aluminium foil
2: Battery
3: Aluminium blister pack
5: Other plastic bottle
6: Clear plastic bottle
7: Glass bottle
8: Plastic bottle cap
9: Metal bottle cap
10: Broken glass
11: Food Can
12: Aerosol
13: Drink can
14: Toilet tube
15: Other carton
16: Egg carton
17: Drink carton
18: Corrugated carton
22: Disposable plastic cup
24: Glass cup
25: Other plastic cup
27: Glass jar
28: Plastic lid
29: Metal lid
30: Other plastic
31: Magazine paper
34: Normal paper
35: Paper bag
36: Plastified paper bag
45: Tupperware
47: Foam food container
48: Other plastic container
51: Pop tab
53: Scrap metal
54: Shoe
55: Squeezable tube
58: Styrofoam piece

(22: Disposable plastic cup)

(10: Broken glass)

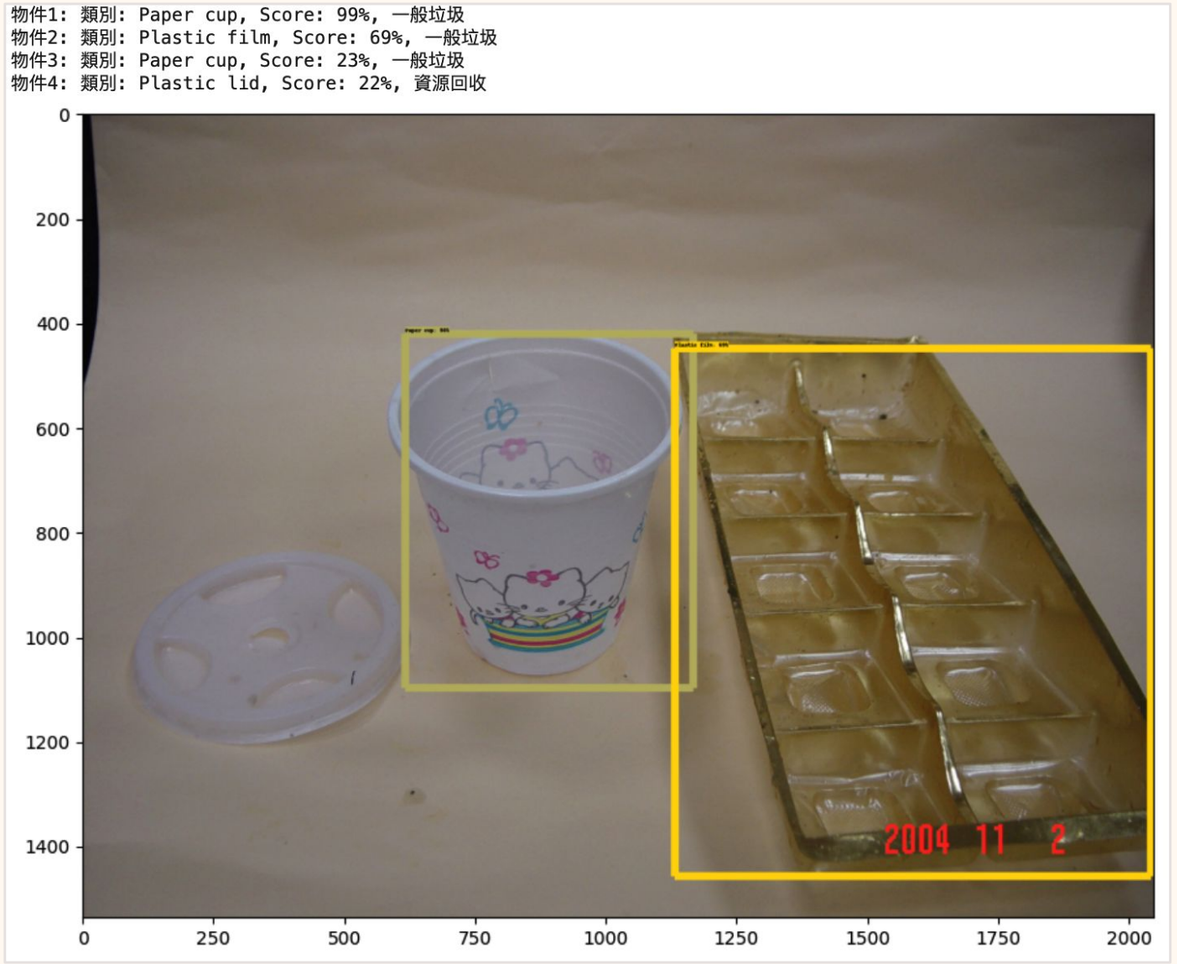
(55: Squeezable tube)

Experiments - 辨別垃圾 (簡單分類)



[Kaggle taco-trash-dataset]

Experiments - Our Images



photos from google

Limitation - Our Images

Limitation

1. Category Duplication
2. Yellow will be recognized as Crisp packet
3. Can’t work on GPU

Guess

- Only did 10 training steps for demonstration purposes.
- Photos from US and UK
- Lack of some category dataset

photos from google

Expected outcome

自動垃圾辨識模型

(期望:智能垃圾分類桶)

- **模型應用於垃圾分類桶**
- **方便市民進行回收分類**
- **有效提高垃圾處理效率**

[2022 Clean Robotics: TrashBot]

References

- Taco Dataset
  http://tacodataset.org/
- Cleanrobotics
  https://cleanrobotics.com/
- Kaggle: TACO (Trash Annotations in Context) Trained Models
  https://www.kaggle.com/datasets/bouweceunen/trained-models-taco-trash-annotations-in-context/data
- TrashBot 推 18 萬元 AI 垃圾桶，讓消費者「無腦」丟垃圾
  https://technews.tw/2022/09/11/clean-robotics-trashbot/

Thanks for your attention!