Spring 2024
Introduction to Artificial Intelligence
Homework 0

Feb. 22, 2024

Introduction

We suggest using the Python language to implement all programming assignments in this course. The purpose of this assignment is to help you get started with Python. Moreover, we will use the following exercises in subsequent homework.

Setting up your environment

If you don't have Python installed on your machine, we recommend Google Colab. If you want to work on your own machine, we recommend installing Anaconda to manage your Python environments. Please install Python with version 3.8 (or up), which is the version TAs use to grade in this course.

Python tutorial

We suggest you follow this tutorial: https://cs231n.github.io/python-numpy-tutorial/ If you are familiar with Python, you can skip this part.
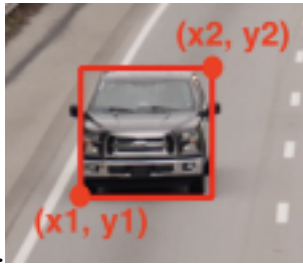
Exercise

Part 1 : Python

(15%) Exercise 1: Draw bounding box on cars

- The text file (**bounding_box.txt**) and image (**image.png**) can be found from the "data" folder on E3 HW0.
- Read the text file. The text file contains the coordinates of the bounding box. The format is following by:

  x1 y1 x2 y2 …

E.g.

- Install any python packages which can read images (e.g., Pillow, OpenCV), and read their documentation to learn how to use functions.
- Draw bounding boxes on the image. The coordinate (x1, y1) is the bottom left corner of a bounding box. The coordinate (x2, y2) is the top right corner.
- Save the image with bounding box as below:

(35%) Exercise 2: Extract the pixels of the objects that are moving in the video.

- The video (**video.mp4**) can be found from the "data" folder on E3 HW0.
- Write your Python code to remove the background in the video, and take a screenshot of the final result like the image below. Note that you should stack the pictures shown as follows (Hint 2).
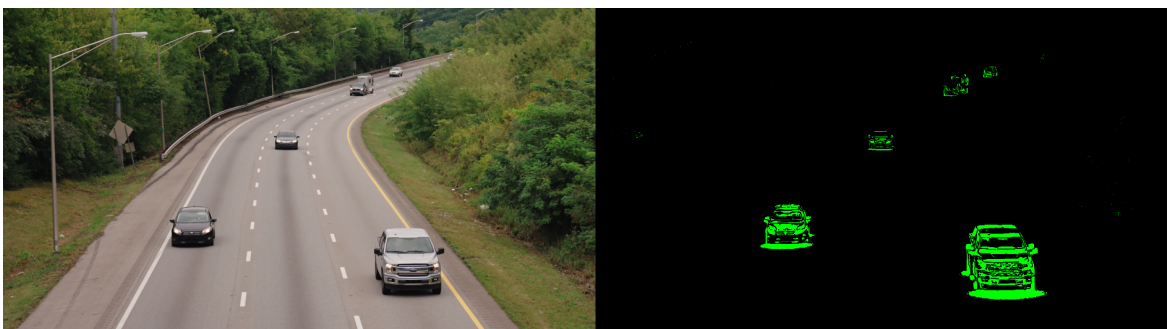
- Hint1 : Use OpenCV packages which can remove the background. (e.g., **cv2.absdiff**)
- Hint2 : You can use **numpy.hstack** to show two frames at the same time.

(30%) Exercise 3:

- Data augmentation is an important technique used in deep learning to avoid overfitting. For example, in the field of computer vision, we often perform "translation", "rotation", "flipping", "scaling", "cropping", and other data augmentation techniques on input images. In this section, you are required to try **five** different data augmentation techniques on image (**image.png**).
- The result should be submitted in a PDF format, list out the augmentation you used and the transformed pictures.

Part 2 : ChatGPT
(20%) Exercise 1:
- ChatGPT: https://openai.com/blog/chatgpt/
- Pick two topics below, think of a question on each topic and try it on ChatGPT, screenshot both implementations, you can refer to the link below.
  - NLP Tasks
  - Code
  - Structured output style
  - Unstructured output style
  - Media types
  - Meta ChatGPT
  - Expert Prompting
  - https://www.kdnuggets.com/publications/sheets/ChatGPT_Cheatsheet_Costa.pdf?fbclid=IwAR2Ns5-8p1wRQbCYxyFLPGXJZbVunWKaYstovHaZRu9fGWtnIiM8KKQoS7c
- Write out the things you think ChatGPT **Can-Do** and **Cannot-Do**, within 200 words, both English and Chinese are available.
- Output the two screenshots and thoughts to a **PDF file**.

Grading

In this homework, you will get full credit on each exercise if you achieve the requirements and **will not** get any part score if you didn't, which means there will be only 0, 15, 50, 80, 100 five kinds of score . **No Plagiarism**. You will get 0 in this homework if any plagiarism is found.

Discussion

TAs had opened a channel HW0 討論區 on Microsoft Teams of the course, you can ask questions about the homework in the channel. TAs will answer questions in the channel as soon as possible.

Discussion rules:

1. Do not ask for the answer to the homework (probably no need to worry about this homework).

2. Check if someone has asked the question you have before asking.

3. We encourage you to answer other students' questions, but again, do not give the answer to the homework. Reply to the messages to answer questions.

4. Since we have this discussion channel, do not send emails to ask questions about the homework unless the questions are personal and you do not want to ask publicly.

Submission

1. **The deadline for this homework is 3/5 (Tue.) 23:59:00.**

2. Please submit one zip file that contains the following files:
   - (Part 1, Exercise 1): hw0_111xxxxxx_1.py + hw0_111xxxxxx_1.png
   - (Part 1, Exercise 2): hw0_111xxxxxx_2.py + hw0_111xxxxxx_2.png
   - (Part 1, Exercise 3): hw0_111xxxxxx_3.py + hw0_111xxxxxx_3.pdf
   - (Part 2): hw0_111xxxxxx_4.pdf

3. Submit the zip file with the filename of HW#number_StudentID.zip (e.g., HW0_111123456.zip). Please refer to the File Organization section to name each submission file.

4. Late submission leads to a score of (original score)*0.7, for example, if you submit your homework right after the deadline, you will get (original score)*0.7 points.

5. We only accept one zip file, wrong format or naming format cause -10 points to your score (after considering late submission penalty).

6. If there is anything you are not sure about submission, ask in the discussion forum.

File Organization

1. The input file names should follow in this spec (**blue bold words** above) for TAs to test your results. The wrong format will cause -10 points as well. You don't need to hand these input

files in.

2. Please follow the file hierarchy and the naming rules specified below. (Three python file, two png, two pdf total)

- hw0_111xxxxxx.zip
    - hw0_111xxxxxx_1.py
    - hw0_111xxxxxx_1.png
    - hw0_111xxxxxx_2.py
    - hw0_111xxxxxx_2.png
    - hw0_111xxxxxx_3.py
    - hw0_111xxxxxx_3.pdf
    - hw0_111xxxxxx_4.pdf

Reference

- Python 100 Days: https://github.com/jackfrued/Python-100-Days
- Python numpy tutorial:https://cs231n.github.io/python-numpy-tutorial/
- https://www.kdnuggets.com/publications/sheets/ChatGPT_Cheatsheet_Costa.pdf?fbclid=IwAR2Ns5-8p1wRQbCYxyFLPGXJZbVunWKaYstovHaZRu9fGWtnIiM8KKQoS7c
- https://openai.com/blog/chatgpt/