Homework 05: due 2022/05/18 23:59(100%)

- There are differences between every OpenCV version, please use the version 4.4.0.40 to avoid generating bugs.

- Tutorial :

1. Feature extraction and matching:
   https://docs.opencv.org/4.4.0/db/d27/tutorial_py_table_of_contents_feature2d.html (https://docs.opencv.org/4.4.0/db/d27/tutorial_py_table_of_contents_feature2d.html)
2. Feature detectors (ORB & FAST): https://medium.com/data-breach/introduction-to-orb-oriented-fast-and-rotated-brief-4220e8ec40cf (https://medium.com/data-breach/introduction-to-orb-oriented-fast-and-rotated-brief-4220e8ec40cf)

- After you go through the tutorials, you should be able to work on this assignment.

- Please answer the following questions and work directly on this jupyter notebook.

- Make sure the code can be run and show the result and figures properly.

- Please write down your observation with markdown in this notebook briefly.

In [ ]:

```
# Set up the environment
## Install opencv with version 4.4.0
!pip3 install opencv-python==4.4.0.40
```

Requirement already satisfied: opencv-python==4.4.0.40 in /usr/local/lib/python3.7/dist-packages (4.4.0.40)
Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-python==4.4.0.40) (1.21.6)

In [ ]:

```
# Download the images
!gdown --id "1LaYcBfYtjdze8pCBPTfMjnTFOp46B7yC" --output ./test1.jpg
!gdown --id "1VlOx8bBkzPSrn6AEeZ2-pgl-a6F3vtzO" --output ./test2.jpg
```

```
/usr/local/lib/python3.7/dist-packages/gdown/cli.py:131: FutureWarning: Op
tion `--id` was deprecated in version 4.3.1 and will be removed in 5.0. Yo
u don't need to pass it anymore to use a file ID.
  category=FutureWarning,
Downloading...
From: https://drive.google.com/uc?id=1LaYcBfYtjdze8pCBPTfMjnTFOp46B7yC
To: /content/test1.jpg
100% 221k/221k [00:00<00:00, 38.2MB/s]
/usr/local/lib/python3.7/dist-packages/gdown/cli.py:131: FutureWarning: Op
tion `--id` was deprecated in version 4.3.1 and will be removed in 5.0. Yo
u don't need to pass it anymore to use a file ID.
  category=FutureWarning,
Downloading...
From: https://drive.google.com/uc?id=1VlOx8bBkzPSrn6AEeZ2-pgl-a6F3vtzO
To: /content/test2.jpg
100% 221k/221k [00:00<00:00, 88.5MB/s]
```

In [ ]:

```python
import cv2
import numpy as np
import matplotlib.pyplot as plt
```

1. Feature detector (40%)

Please use the following feature detectors (FAST, ORB, SIFT) and draw the feature points on the test1.jpg images.

(Example figure)

In [ ]:
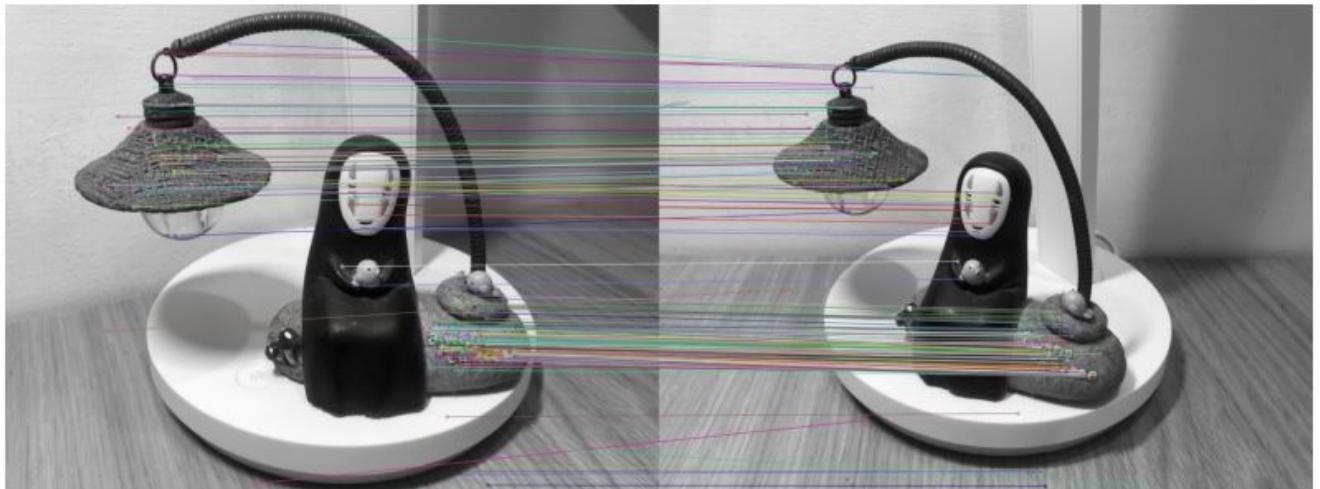
2. Feature matching (60%)

Please match the feature points from the test1.jpg and test2.jpg.Also, please apply Lowe's ratio test (with ratio 0.6 and 0.8) to match the features and observe the differences when adjusting the ratio.
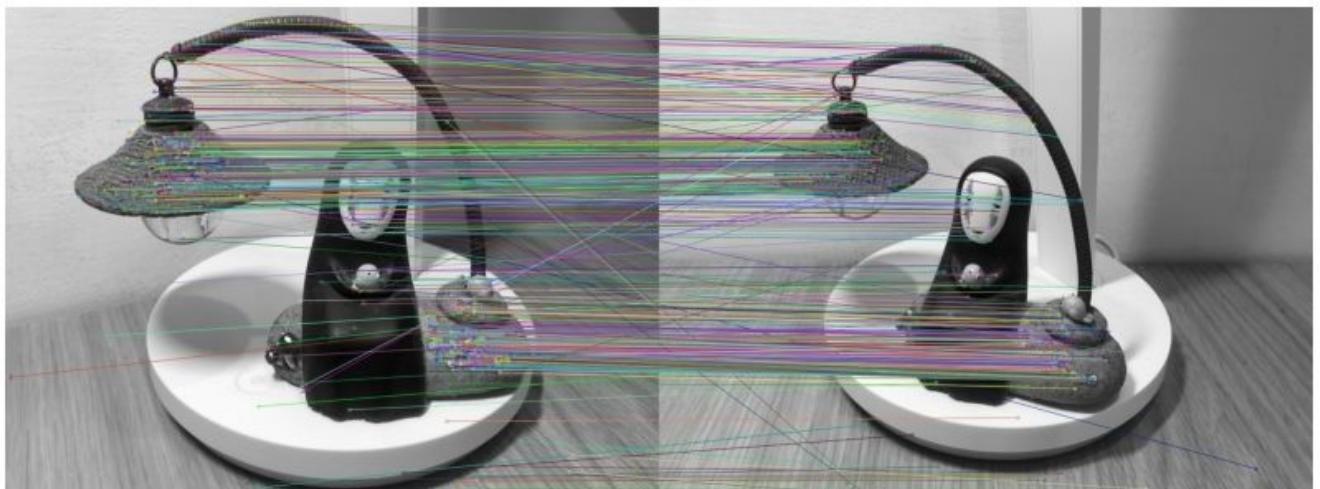
### 2.1 Please use SIFT as feature detector and descriptor.(30%)

(Example figure)
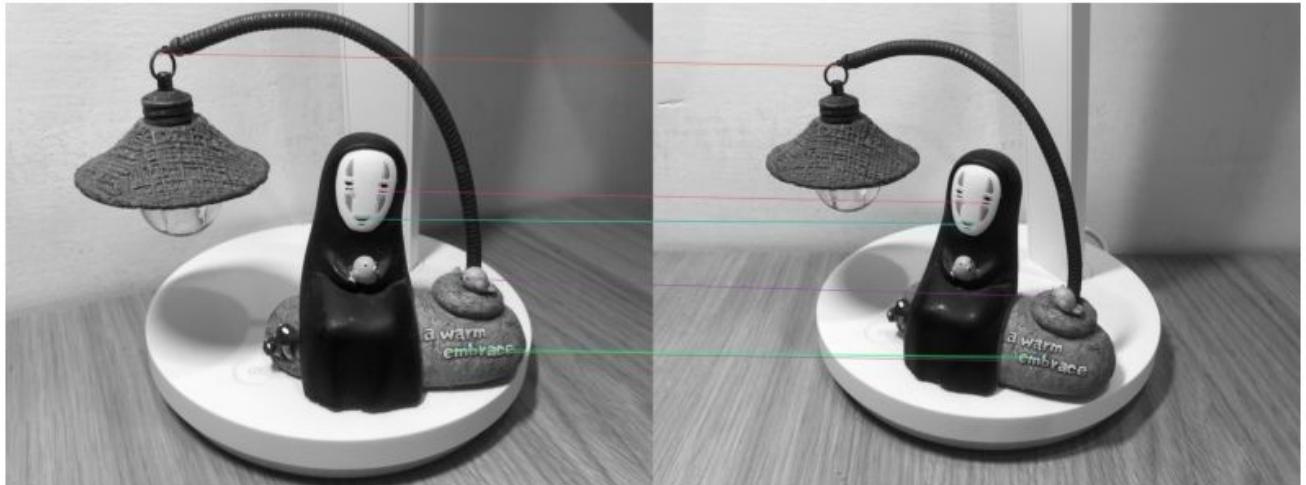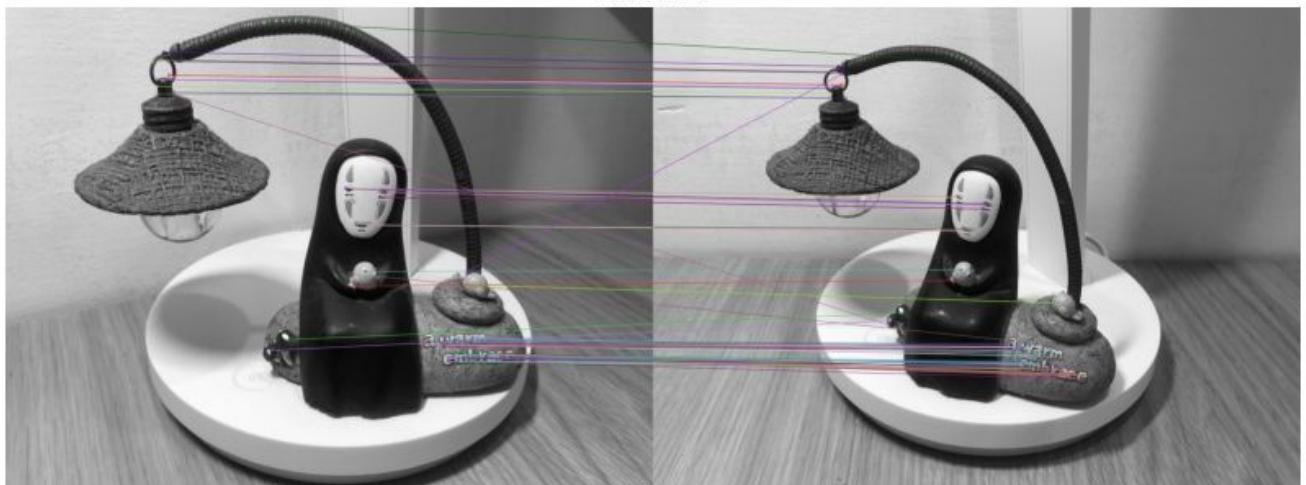
Ratio (0.6)

Ratio (0.8)

In [ ]:

2.2 Please use ORB as feature detector and descriptor.(30%)

(Example figure)

Ratio (0.6)

Ratio (0.8)

In [ ]: