

**National University of Sciences and Technology
School of Electrical Engineering and Computer Science
Department of Computer Science**

CS474: Computer Vision

Spring 2020

Assignment 1

Image features Detection and Matching

Image Classification

Announcement Date: 17th Feb, 2020

Due Date: 2nd March 2020 11:55 pm (on LMS)

Instructor: Dr. Muhammad Moazam Fraz

Task : Image Feature Extraction and Matching

A local image feature is a tiny patch in the image that's invariant to image scaling, rotation and change in illumination. It's like the tip of a tower, or the corner of a window in the image above. Unlike a random point on the background (sky) in the image above, the tip of the tower can be precisely detected in most images of the same scene. It is geometrically (translation, rotation, ...) and photometrically (brightness, exposure, ...) invariant.

The extracted local features must be:

- *Repeatable* and *precise* so they can be extracted from different images showing the same object.
- *Distinctive* to the image, so images with different structure will not have them.

There could be hundreds or thousands of such features in an image. An image matcher algorithm could still work if some of the features are blocked by an object or badly deformed due to change in brightness or exposure. Many local feature algorithms are highly efficient and can be used in real-time applications. Due to these requirements, most local feature detectors extract corners and blobs.

Local Feature Detection and Description

There is a wealth of algorithms satisfying the above requirements for feature detection (finding interest points on an image) and description (generating a vector representation for them). They include

- [Scale Invariant Feature Transform \(SIFT\)](#)
- [Speeded-Up Robust Features \(SURF\)](#)
- [Features from Accelerated Segment Test \(FAST\)](#)
- [Binary Robust Independent Elementary Features \(BRIEF\)](#)
- [Oriented FAST and Rotated BRIEF \(ORB\)](#)

Task:

Download the set of images available in the zip folder of this assignment. There are three sets of images available in the zip file at the following link. **The link can be accessed using SEecs email address only.** (<https://drive.google.com/open?id=14jSNKLgHPBMmuV6VK0fofcrA97sYd10h>)

- Set 1: book.jpg and book_person_holding.jpg
- Set 2: roma_1 and roma_2.jpg
- Set 3: building_1.jpg , building_2.jpg and building_3.jpg

Apply any of the above local feature detector/descriptor for feature detection and find similarity between detected features. Show the similarity of top 10 matched features by drawing the line between the matched features.

Deliverable:

You may download [PyCharm](#), an IDE to work for in Python. Implement your task using IDE

- The code files (.py files)
- A MS Word /PDF file containing following
 - Qualitative results i.e. a pair of images showing top 10/X number of matches by using the above mentioned local feature detectors/descriptors. You are suggested to use at least three of the feature detectors/descriptors.

There are three matching sets of images (building, roma and book). You need to demonstrate matching within sets only.