**Lab 7: SIFT, Scale-Invariant Feature Transform, using MATLAB or Python**

**NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*This lab assignment should be done in teams of two. Go through the exercises below and show your results.*

**Feature Detection and Extraction**

Introduction: local features and their descriptors are the building blocks of many computer vision algorithms. Their applications include image registration, object detection and classification, tracking, motion estimation, and content-based image retrieval (CBIR). These algorithms use local features to better handle scale changes, rotation, and occlusion. Computer Vision algorithms include the FAST, Harris, and Shi & Tomasi corner detectors, and the SIFT, SURF, KAZE, and MSER blob detectors. Available functions (in OpenCv and MATLAB) include SIFT, SURF, FREAK, BRISK, LBP, ORB, and HOG descriptors. You can mix and match the detectors and the descriptors depending on the requirements of your application.

**Note: you may use either MATLAB or Python**

**Option01: MATLAB**

**Part 1:**

We learned that SIFT is a computer vision algorithm to detect, describe, and match local features in images. The task for this lab is to detect SIFT features from an image (cameraman.tif)

1. MATLAB offers SIFTPoints as an object for storing SIFT interest points. Discover the properties of this object and use them to display the location of the 10 strongest points in the image (display the [*x* *y*] coordinates for the selected points on the image and write them down as coordinates).
2. Detect SIFT features in the image. Display the last 5 detected points by plotting them on the original image.

**Part 2:**

Here we will use a feature extractor and new detector that uses Harris Features.

MATLAB also offers a way to extractFeatures. It extracts interest point descriptor and returns extracted feature vectors (also known as descriptors), and their corresponding locations, from a binary or intensity image.

This function derives the descriptors from pixels surrounding an interest point. The pixels represent and match features specified by a single-point location. Each single-point specifies the center location of a neighborhood. The method you use for descriptor extraction depends on the class of the input points.

1. Extract corner features from the cameraman.tif image. Use the MATLAB detectHarrisFeatures detector and extractFeatures to find and extract corner features from the image. Plot these features on the original image.

**Option02: Implementing SIFT in Python:**

* Implementing SIFT in Python: a Complete Guide – Part I: [click here](https://medium.com/@russmislam/implementing-sift-in-python-a-complete-guide-part-1-306a99b50aa5)
* Implementing SIFT in Python: a Complete Guide – Part II: [click here](https://medium.com/@russmislam/implementing-sift-in-python-a-complete-guide-part-2-c4350274be2b)
* OpenCV implementation: [click here](https://github.com/opencv/opencv/blob/4.x/modules/features2d/src/sift.dispatch.cpp)