# CS 282
# Programming Assignment 3
# (Epipolar Geometry)

*Instructor: Pros Naval*

Individual Submissions
Due: 12:00 noon of December 4, 2023

In this Programming Assignment, you are expected to write some OpenCV code for estimating the fundamental matrix and performing triangulation. You will be working on the pair of images found in the folder named `epipairs`.

**Instructions**

1. Load the image pair `library1_camera`, `library2_camera` and matching points file `library_matches.txt`.
2. Fit a fundamental matrix to the matching points. There is no need to use RANSAC here since all the matches are correct. Report the residual, which should be the mean squared distance (in pixels) between points in the second image and the corresponding epipolar lines.
3. Now fit a fundamental matrix based on putative correspondences obtained by your code from Programming Assignment 2. Because the set of putative matches includes outliers, you will need to use RANSAC. For this part, use only the normalized fitting approach.
4. Load the camera matrices for the two images (they are stored as 3x4 matrices in the files `library1_camera.txt` and `library2_camera.txt`). Find the centers of the two cameras. Use linear least squares to triangulate the position of each matching pair of points given the two cameras. Display the two camera centers and scene matches in 3D. Also compute the residuals between the observed 2D points and the projected 3D points in the two images.
5. Apply triangulation to inlier matches that you obtained in step 3 above.

**Deliverable**

- Jupyter Notebook OpenCV codes (with detailed comments)

The deadline for submission is **12:00 noon of December 4, 2023**. Delayed submissions will incur penalty points up to December 11, after which submissions will no longer be accepted. Email source codes to `submit2pcnaval@gmail.com` with "[CS282: PA3 Submission] <Your Name>" on the subject line.