Homework IPCV 2025

Welcome to the Homework of the Image Processing and Computer Vision course, where you can test what you have learned during this first part of lectures. The objective of this assignment is to demonstrate that you have learned the concepts shown in class by writing Python notebooks and by producing a scientific report in which to describe your experience. Take time to reason and collaborate within your team and, most importantly, have fun! :)

Instructions:

Register your team: You have to register your team (up to 3 team members) on the following form https://forms.office.com/e/NH3JZ4f1JF

Perform the assignments: Solve the two exercises provided in this document by implementing your own Python code. Acquire your **own images** to demonstrate your method.

Write the report: write a short report (max 5 pages in PDF format) describing your solution in detail. For each task illustrate the rationale of your solution, provide all the mathematical steps you have performed (use formulas!) and include all the visualization needed to explain your solution (intermediate results, processed images, annotated images…) with captions and well-prepared descriptions.

Project delivery: create a zip with your code and the report, then upload it on onedrive / google drive / dropbox and send the link to the zip to luca.magri2@unibocconi.it.
The deadline is strict: March 28th 2025 23:59 CET

Bonus points: You can earn up to +2 extra points by submitting high quality notes for the Geometric Computer Vision lectures. To be eligible for the extra points, the notes must be complete and accurate. You can submit the notes in digital drawing or even LaTeX so that I can edit the notes and distribute them to the entire class.

1) Single view metrology (5 pts)

Implement an algorithm capable of estimating a person's height from a single image. The image must include a person whose height is unknown and a reference object (such as another person) with a known height.

Specifically, capture an image of two people, A and B, standing on the same horizontal plane. A and B must be in general position with respect to the camera. Assume that the height of person A is known and estimate the height of person B by leveraging only on projective geometry. When acquiring the image, ensure that your image contains sufficient geometric cues to facilitate the estimation.

2) The eight point algorithm (5 pts)

Implement the eight-point algorithm and test it on a pair of images that you have captured yourself. You can either use SIFT with robust fitting to extract correspondences or manually annotate the images (a minimum of 10 correspondences is sufficient).
Estimate the fundamental matrix **F** using your algorithm and visualize the results by plotting all the epipolar lines in the first image. Use a geometric error to assess how well your estimate describe the epipolar geometry.