

CS7GV1 Computer Vision

Mid-term Project 2022/23

This mid-term project adapts several Exercises from Chapter 3 of Szeliski's book.

You should submit, in a zip file, all code, images and a PDF report before midnight on **Monday 14th November, 2022.**

NOTES:

1: You must implement convolution and generate your own kernels in **vanilla Python** for all the filters, i.e., you may not use OpenCV to implement the filters

2: You may use OpenCV to open and display the images

Part 1: Photo effects (10%).

Write a variety of photo enhancement or effects filters: contrast, solarization (quantization), etc. Implement at least **5** filters

Apply all filters to at least **3** photos *you have taken yourself*.

In your report – present your results, and discuss how you implemented them, which ones are useful (perform sensible corrections) and which ones are more creative (create unusual images)?

Part 2: Sharpening, blur, and noise removal (15%).

Implement at least **5** softening, sharpening, and non-linear diffusion (selective sharpening or noise removal) filters, such as Gaussian, median, and bilateral (Section 3.3.1), as discussed in Section 3.4.2.

Take at least **3** of your own photos that are blurry or noisy (e.g., shooting in low light is a good way to get both) and try to improve their appearance and legibility with all five filters you implemented.

In your report – present your results, discuss how you implemented them, and compare the outcomes with each other.

Part 3: High-quality image resampling (15%).

Implement at least **5** filtering/interpolation methods, which should include at least 2 to be used for minification and 2 for magnification, and some can be used for both. You can use those presented in Section 3.5.2 and others you read about.

Using **2** synthetic images (such as Figure 3.52a): one with a high resolution, that you will use for minification; and **2** natural images with lots of high-frequency detail (such as Figure 3.52b–c – but your own photos), again, one with a high resolution and one with a small resolution. Apply your methods to resize your image. Discuss and compare the performance of all of your methods as well as the trade-off between speed and quality. In your report, provide the original of each image, and at least 3 different resized images that demonstrate the results.