

Statement: Image Stitching Project

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1 Image georeferencing

The initial georeferencing of raw satellite images is assumed to provide a coarse geolocation. This geolocation must be refined according to an absolute reference. We take advantage of a well geo-referenced absolute reference to correct the coarse geolocation of raw images.

The objective of this task is to perform the georeferencing of one image using another reference image. This process is also known as coregistration.

For this task, you will work with two Sentinel-2 images:

- **Registered:** S2A_MSIL1C_20230312T042701_N0509_R133_T45QZF_20230312T062152
- **Reference:** S2A_MSIL1C_20230312T042701_N0509_R133_T46QBL_20230312T062152

These two images are freely accessible on the “Copernicus Open Access Hub”.

- (a) As Level-1C Sentinel-2 images are already well georeferenced, the first step will be to simulate a “wrongly geo-referenced” image, by applying a padding of 30 pixels on the registered image, on the vertical and horizontal axis. An overview of the two images is given in Figure 1.

It is advised to use Rasterio or GDAL to manipulate the rasters and Numpy to apply the padding, but other libraries are accepted. Note that the padding should be applied to the pixels of the raster and not on its affine transform.

- (b) Once the transformation is performed, you are invited to perform the georeferencing of the registered image. You are encouraged to use a feature-based method on the band B04 of the Sentinel-2 images, but other georeferencing methods are accepted. Please provide:
 - The algorithms used.
 - The performances achieved.
 - An image showing the features extracted by the feature-based method, if used.
- (c) Applying a feature-based method over multiple images is computationally expensive. How could we reduce the computational burden of this method? Assume that the only cause of registration error is a translation transformation (shifts of <20 pixels).