Instructions for the shape and symmetry features

I. Quality control of the available masks and images

The training dataset is made of 250 images and masks of insects. However, the masks should first be cleaned before applying any further processing. This pre-processing step can consist in:
- Loading the mask and associated image
- Eventually subsampling the mask and image
- Transforming the mask into a binary image (label 1 being the insect, label 0 the background)
- Computing the connected components of the binary mask
- Restricting the binary mask to its connected component of highest area
- Restricting both mask and image to the bounding box of the cleaned binary mask

You can visualize the resulted images and masks saving figures such as the ones below in a distinct directory:

Check that the pre-processing went well. If you see images with problems, apply additional pre-processings or remove these images and their associated masks.

II. Computation of the best inscribed circle

As you can see in the above images, the available masks do not focus only on the main body of the insect, possibly including wings, legs, antennae or even background. However, we would like to create a region of interest included in the main body of the insect. To do that, we can search the best inscribed circle, namely the circle inside the mask with the highest area. To ensure that the circle is inside the body, we will initialize its center with the centroid of the mask – that is usually inside the main body of the insect, which can checked visually with an additional quality control.
Following the structure of the first lab, compute the best inscribed circle by:
- Choosing a proper inialization relying on the centroid of the mask
- Defining a loss function to minimize
- Minimizing the defined loss using the minimize function of Scipy
- Visualizing your results efficiently

III. Computation of the best symmetry plane

We expect most available species to have a symmetry plane from the head to the sting. To simplify, we can transform the search of the best symmetry plane to the obtention of the optimal rotation of the image so that a vertical line of this rotated image is associated with the best symmetry plane.

Following the structure of the first lab, compute the best symmetry plane by:

- Choosing a proper inialization among rotations of the input image at different angles around the center of the best inscribed circle
- Using the filled and proper rotation function from lab 1
- Using your own function to create the symmetric of an image around a vertical line going through a point of coordinates (xc, yc)
- Defining a loss function to minimize relying on the input image, its symmetric image, and the best inscribed circle
- Minimizing the defined loss using the minimize function of Scipy

IV. Features' extraction

Compute features from the two previously created masks and images, possibly after improving your method. Represent the associated values in a 2D space. Comment. Can these features be used to make the distinction between several species, or types of acquisition's view?