Lungs segmentation

The input to the procedure of lungs segmentations are two images: CT and body mask (shown in Fig. 1).

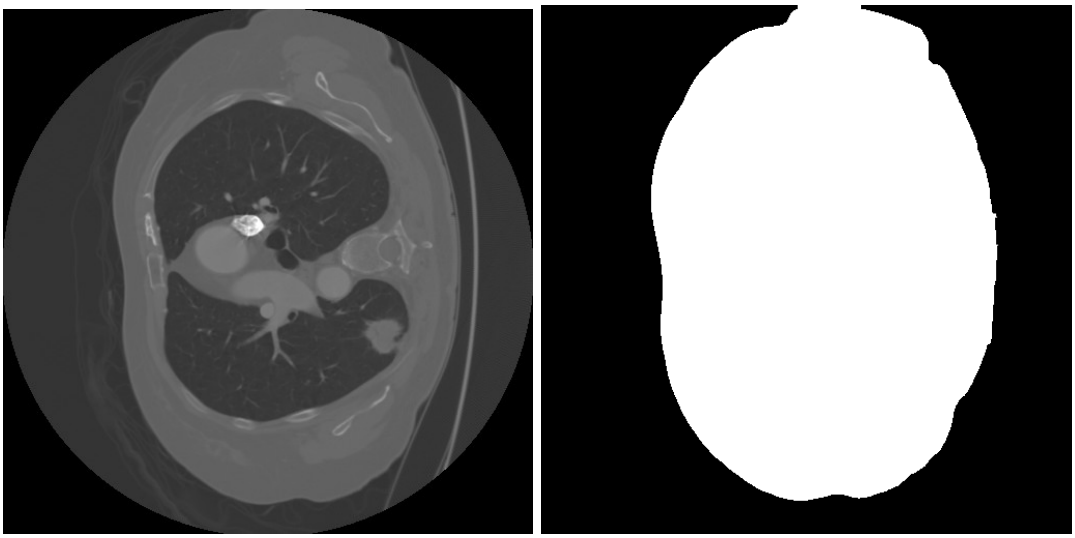

Fig. 1 CT image (left) and corresponding body mask (right)

The segmentation of lungs may, possibly, proceed directly in 3D as follows:

1. Run binarization of the CT image using a threshold of -320 HU – every voxel with HU lower than this threshold should receive label 1 (air label) and the remaining voxels should receive label 0

2. Use body mask to select only air regions within body

3. Design a sequence of morphological (and other appropriate) operations to fill the holes in the interior of lungs and to remove 'air' clusters which do not correspond to lungs (e.g. gas in bowels) – at the end one should be left with clusters which correspond only to airways

4. Use watershed from markers (scikit-image -> segmentation -> watershed) to extract the left and the right lung from the segmentation being the result of step (3) above. Before using watershed design a procedure for defining the three markers (marker of left lung, marker of right lung, marker of background).

5. To compare segmentation results with reference segmentations available at Lab One Drive use Dice coefficient and Hausdorff distance (find the definitions of these quantities) as implemented in surface-distance package (https://github.com/google-deepmind/surface-distance).

The project results (Dice coefficients and Hausdorff distance) should be reported for the three tasks: body mask segmentation, left lung segmentation, right lung segmentation.