Assignment 2

Deadline for submission:

- 1 week (strict – until Tuesday ***14 December 2021*** 20:00 PM)
- Late submissions will not be possible!
- Only *complete* submissions in Moodle will be graded (both files submitted)!

Upload in Moodle: 2 files:

- 1 doc/docx or pdf document (code & images & explanations, in sequential manner: specify the subsection number, add the code & images & explanations, then continue with the next subsection, add code … and so on);
- 1 Python file with the entire code – *file_student_name.py*

Important: Students will present their assignments and answer questions during laboratory_5 and dedicated meetings in the *Project_assignments* channel in Teams. The assignments are not graded without a discussion student-professor in Teams! (all questions regarding the assignments will relate to the files uploaded to Moodle).

General Requirements

Solve all the following exercises in 1 Python file, using Numpy, OpenCV and Matplotlib functions as indicated.

Subsection 1.

Identify your assigned working image in the table, *im_x.jpg*.

Perform color segmentation on the read image by choosing the correct color space, color component and threshold/thresholds. The output image should be a binary image with black for the background and white for all the objects in the foreground. Save the segmented image as *segmented_x.jpg*. Explain your choice of the color component and the threshold used.

If necessary, perform the appropriate morphological operations on the segmented image to remove potential noise and to fill the holes in objects. Save the resulting image as *segmented_improved_x.jpg*.

Subsection 2.

Label the blobs in the previous image using connected components analysis. Save the image with labels as *blobs_x.jpg*.

Write the code to count the objects assigned to you in the table. To do this, you have to discard objects having incorrect numbers of connected components. Pay attention at connected objects. Display an image containing only the valid objects, where each valid object is depicted with a color of your choice. In the top right corner of this image, display a text like this one: “Counted objects: N”, where N is the number of objects that the algorithm has counted. Save the image as *valid_blobs_x.jpg*.

Subsection 3.

Read the pair of ***images to match***, assigned to you in the table. Use SIFT or ORB descriptors to match features, as indicated in the table. Use Brute Force Matcher to match the descriptors computed earlier. Create the Matcher object using `cv2.BFMatcher()`. Specify the correct distance measurement to be used: `cv2.NORM_L2` or `cv2.NORM_HAMMING`. Once the BFMatcher object is created, use the method `BFMatcher.match()` to match the descriptors. Sort them in ascending order of their distances, so that best matches (with low distance) come in front. Draw only first 15-20 matches using the function `cv2.drawMatches` and save the final image as *mached.jpg*. Comment on the result of the matching process. Are the various features correctly identified?

Another example of Brute Force Matching can be studied here.

Student		***Group***	***Working image***	***Objects to count (subsection 2)***	***Images to match & Features method (subsection 3)***	
ANDREESCU	Radu-Mihai	443C	*im_1.jpg*	round objects	*books.jpg* & *anna.jpg*	ORB
ANGHEL	Alexandru-Petruț	442G	*im_2.jpg*	numbers	*books.jpg* & *casa.jpg*	SIFT
BANȚĂ	Bogdan-Gabriel	441G	*im_3.jpg*	round objects	*set.jpg* & *geister.jpg*	ORB
BĂDIȚĂ	Violeta-Nicoleta	445C	*im_4.jpg*	numbers	*set.jpg* & *lucy.jpg*	SIFT
BĂLTĂREȚU	Marinela-Ionela	441C	*im_5.jpg*	round objects	*set.jpg* & *istorii.jpg*	ORB
BERGHILĂ	Elena	442G	*im_6.jpg*	numbers	*all.jpg* & *it.jpg*	ORB
CĂRUNTU	Dan-Gabriel	441C	*im_7.jpg*	round objects	*books.jpg* & *anna.jpg*	SIFT
CHICAN	Costin-Andrei	442C	*im_8.jpg*	numbers	*books.jpg* & *casa.jpg*	ORB
CHIRA	Carmen Alexandra	442G	*im_1.jpg*	round objects	*set.jpg* & *geister.jpg*	SIFT
CINCAN	Doru-Petruţ	444C	*im_2.jpg*	numbers	*set.jpg* & *lucy.jpg*	ORB
CONSTANTINESCU	Maria-Ecaterina	442G	*im_3.jpg*	round objects	*set.jpg* & *istorii.jpg*	SIFT
CORBU	Vlad	444C	*im_4.jpg*	numbers	*all.jpg* & *it.jpg*	ORB
COSTEA	George	441C	*im_5.jpg*	round objects	*books.jpg* & *anna.jpg*	ORB
DEMIDOV	Oana	441G	*im_6.jpg*	numbers	*books.jpg* & *casa.jpg*	SIFT
DEPĂRĂŢEANU	Maria	445C	*im_7.jpg*	round objects	*set.jpg* & *geister.jpg*	ORB
DOBRE	Alexandru Ștefan	444C	*im_8.jpg*	numbers	*set.jpg* & *lucy.jpg*	SIFT
DOBRIN	Cosmin-Iulian	442G	*im_1.jpg*	round objects	*set.jpg* & *istorii.jpg*	ORB
EFTIMESCU	Dan Victor	444C	*im_2.jpg*	numbers	*all.jpg* & *it.jpg*	SIFT

ELISEI	Ștefan-Sergiu	444C	*im_3.jpg*	round objects	*books.jpg* & *anna.jpg*	ORB
ENACHE	George-Vlad	441G	*im_4.jpg*	numbers	*books.jpg* & *casa.jpg*	ORB
FETCU	Andrei - Octavian	441C	*im_5.jpg*	round objects	*set.jpg* & *geister.jpg*	SIFT
GEANTĂ	Ionuț-Daniel	441C	*im_6.jpg*	numbers	*set.jpg* & *lucy.jpg*	ORB
GHIORGHIU	Bianca-Alexandra	441G	*im_7.jpg*	round objects	*set.jpg* & *istorii.jpg*	SIFT
GHIȚĂ	Dan-Răzvan	444C	*im_8.jpg*	numbers	*all.jpg* & *it.jpg*	ORB
GORGOI	Adriana-Elena	441C	*im_1.jpg*	round objects	*books.jpg* & *anna.jpg*	SIFT
ILIE	Dragoș-Gabriel	442G	*im_2.jpg*	numbers	*books.jpg* & *casa.jpg*	ORB
MARINESCU	Georgian-Alexandru	441G	*im_3.jpg*	round objects	*set.jpg* & *geister.jpg*	ORB
MARINESCU	Mircea-Matei-Gabriel	442C	*im_4.jpg*	numbers	*set.jpg* & *lucy.jpg*	SIFT
MIHAI	Marius-Răzvan	443C	*im_5.jpg*	round objects	*set.jpg* & *istorii.jpg*	ORB
MIRON	Marian-Bogdan	442G	*im_6.jpg*	numbers	*all.jpg* & *it.jpg*	SIFT
NEAGA	Iulian-Costin	445C	*im_7.jpg*	round objects	*books.jpg* & *anna.jpg*	ORB
NUTU	Raluca-Maria	441G	*im_8.jpg*	numbers	*books.jpg* & *casa.jpg*	SIFT
ONOSE	Alexandru-George	444C	*im_1.jpg*	round objects	*set.jpg* & *geister.jpg*	ORB
OTOPELEANU	Radu-Andrei	442C	*im_2.jpg*	numbers	*set.jpg* & *lucy.jpg*	ORB
PINTILIE	Florin-Cristian	441C	*im_3.jpg*	round objects	*set.jpg* & *istorii.jpg*	SIFT
PÎRLICI	Adelina-Maria	442C	*im_4.jpg*	numbers	*all.jpg* & *it.jpg*	ORB
PODARU	Ștefan	442G	*im_5.jpg*	round objects	*books.jpg* & *anna.jpg*	SIFT
POP	Andrei	441C	*im_6.jpg*	numbers	*books.jpg* & *casa.jpg*	ORB
PREDA	Andreea-Cristina	442G	*im_7.jpg*	round objects	*set.jpg* & *geister.jpg*	SIFT
PREOTEASA	Alex-Petrișor	441G	*im_8.jpg*	numbers	*set.jpg* & *lucy.jpg*	ORB
PRIMINESCU	Raluca-Elena	443C	*im_1.jpg*	round objects	*set.jpg* & *istorii.jpg*	ORB
RADU	Cătălin-Mihai	441G	*im_2.jpg*	numbers	*all.jpg* & *it.jpg*	SIFT

RUSAN	Horia-Alexandru	442C	*im_3.jpg*	round objects	*books.jpg* & *anna.jpg*	ORB
SAVU	Mădălina-Cristina	442G	*im_4.jpg*	numbers	*books.jpg* & *casa.jpg*	SIFT
SIMON	Andra-Elena	443C	*im_5.jpg*	round objects	*set.jpg* & *geister.jpg*	ORB
STANA	Ștefan-Roberto	442G	*im_6.jpg*	numbers	*set.jpg* & *lucy.jpg*	SIFT
STERIAN	Vlad	442G	*im_7.jpg*	round objects	*set.jpg* & *istorii.jpg*	ORB
STROESCU	Ioana-Miruna	442C	*im_8.jpg*	numbers	*all.jpg* & *it.jpg*	ORB
SUCIU	Antonia-Maria	442G	*im_1.jpg*	round objects	*books.jpg* & *anna.jpg*	SIFT
TOMA	Bogdan	441G	*im_2.jpg*	numbers	*books.jpg* & *casa.jpg*	ORB
TUDORACHE	Vlad-Adrian	442C	*im_3.jpg*	round objects	*set.jpg* & *geister.jpg*	SIFT
VÎNTURIŞ	Ramona-Maria	443C	*im_4.jpg*	numbers	*set.jpg* & *lucy.jpg*	ORB