Assignment 3

Deadline for submission:

- 8 days (strict – until Tuesday **18 January 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 dedicated meetings 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.

Identify your assigned working image sets assigned in the table, ***set*x*** for Subsection_1 and ***set*y*** for Subsection_2. The images are located in the archives provided on Moodle.

Subsection_1. PANORAMA STITCHING

Your task is to stitch **all** images in your image ***set*x*** into one big panorama image. Do NOT use the OpenCV Stitcher class!

Read the working images from your image set. Compute the keypoints and descriptors for every image in the image set using ORB algorithm.

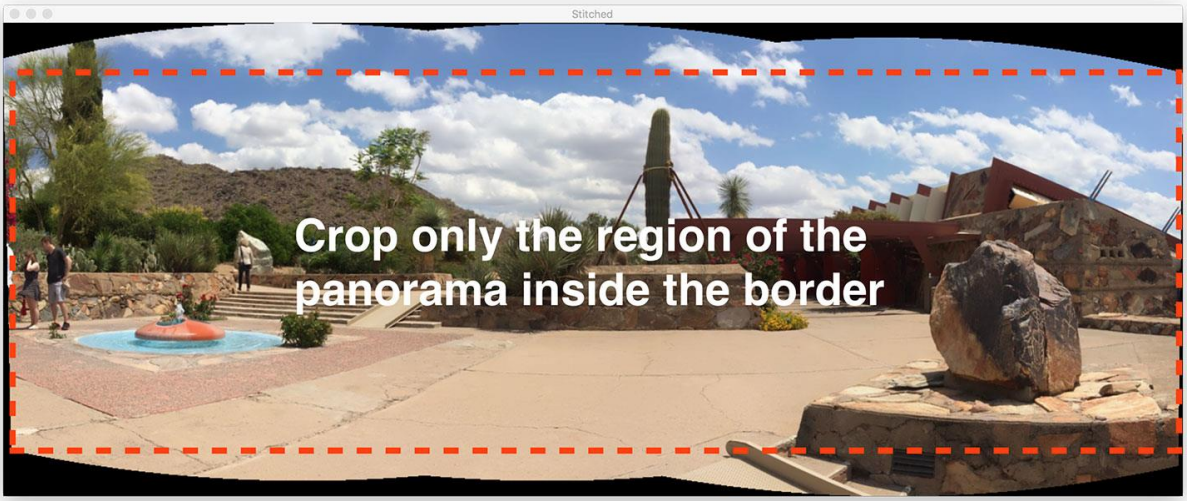
Match the corresponding points between every pair of images using a `DescriptorMatcher` and choose an appropriate number of good matches. Sort the scores in descending order and only take top 15% of the matches as corresponding points for the next step. Display the good matches obtained for every image pair. First find two images that have the best matches and work further with those two.

Compute the homography between those two images using `findHomography` and RANSAC.

Apply the previously found perspective transformation to all pixels in one image to map it to the other image. Stitch the first image to the second aligned image. Display the stitched output image.

Repeat the previous steps to stitch the previously obtained image to a third image in your image set. Do this until you have stitched together all images in your image set.

Remove the black borders in the final stitched panorama image. Do this by reducing the size of the image to the highest size that doesn't contain any black borders. Display the images before and after border removal.



Subsection_2. FINDING KNOWN OBJECTS IN IMAGES

Your task is to find the object presented in *object.jpg*, in **all** cluttered images from ***set*y***.

Read the working images from your image set ***set*y***. Compute the keypoints and descriptors for all images in the image set using SIFT or ORB.

Match the corresponding points between 2 images (object & clutter) using the flann-based knnmatcher and choose only good matches (the first match for a keypoint should be significantly better than the second best match for the same keypoint).

Set a condition that at least 10 good matches must be there to find the object. Otherwise simply show a message saying not enough matches are present.

If enough good matches have been found, display the matches between the two images and compute the homography between them.

Draw a red box around the detected object. To do this, find the points in the cluttered image corresponding to the object in the first image. The object in *object.jpg* is defined by the 4 corners of this image, so you have to find those corners in the clutter image and draw the corresponding polygon in the clutter image. Display the matches and the detected object for **all** clutter images.

Justify your choice of algorithm (SIFT / ORB)!

Student		*Group*	*set*x (Subsection_1)*	*set*y (Subsection_2)*
ANDREESCU	Radu-Mihai	443C	set01	set01
ANGHEL	Alexandru-Petruț	442G	set02	set02
BANȚĂ	Bogdan-Gabriel	441G	set03	set03
BĂDIȚĂ	Violeta-Nicoleta	445C	set04	set04
BĂLTĂREȚU	Marinela-Ionela	441C	set05	set05
BERGHILĂ	Elena	442G	set06	set01
CĂRUNTU	Dan-Gabriel	441C	set07	set02
CHICAN	Costin-Andrei	442C	set08	set03
CHIRA	Carmen Alexandra	442G	set09	set04
CINCAN	Doru-Petruţ	444C	set10	set05
CONSTANTINESCU	Maria-Ecaterina	442G	set11	set01
CORBU	Vlad	444C	set12	set02
COSTEA	George	441C	set13	set03
DEMIDOV	Oana	441G	set14	set04
DEPĂRĂŢEANU	Maria	445C	set15	set05
DOBRE	Alexandru Ștefan	444C	set01	set01
DOBRIN	Cosmin-Iulian	442G	set02	set02
EFTIMESCU	Dan Victor	444C	set03	set03
ELISEI	Ștefan-Sergiu	444C	set04	set04
ENACHE	George-Vlad	441G	set05	set05
FETCU	Andrei - Octavian	441C	set06	set01
GEANTĂ	Ionuț-Daniel	441C	set07	set02
GHIORGHIU	Bianca-Alexandra	441G	set08	set03
GHIȚĂ	Dan-Răzvan	444C	set09	set04
GORGOI	Adriana-Elena	441C	set10	set05
ILIE	Dragoș-Gabriel	442G	set11	set01
MARINESCU	Georgian-Alexandru	441G	set12	set02
MARINESCU	Mircea-Matei-Gabriel	442C	set13	set03
MIHAI	Marius-Răzvan	443C	set14	set04
MIRON	Marian-Bogdan	442G	set15	set05
NEAGA	Iulian-Costin	445C	set01	set01
NUTU	Raluca-Maria	441G	set02	set02
ONOSE	Alexandru-George	444C	set03	set03
OTOPELEANU	Radu-Andrei	442C	set04	set04
PINTILIE	Florin-Cristian	441C	set05	set05
PÎRLICI	Adelina-Maria	442C	set06	set01
PODARU	Ștefan	442G	set07	set02
POP	Andrei	441C	set08	set03
PREDA	Andreea-Cristina	442G	set09	set04
PREOTEASA	Alex-Petrișor	441G	set10	set05
PRIMINESCU	Raluca-Elena	443C	set11	set01
RADU	Cătălin-Mihai	441G	set12	set02
RUSAN	Horia-Alexandru	442C	set13	set03
SAVU	Mădălina-Cristina	442G	set14	set04

SIMON	Andra-Elena	443C	set15	set05
STANA	Ștefan-Roberto	442G	set01	set01
STERIAN	Vlad	442G	set02	set02
STROESCU	Ioana-Miruna	442C	set03	set03
SUCIU	Antonia-Maria	442G	set04	set04
TOMA	Bogdan	441G	set05	set05
TUDORACHE	Vlad-Adrian	442C	set06	set01
VÎNTURIŞ	Ramona-Maria	443C	set07	set02