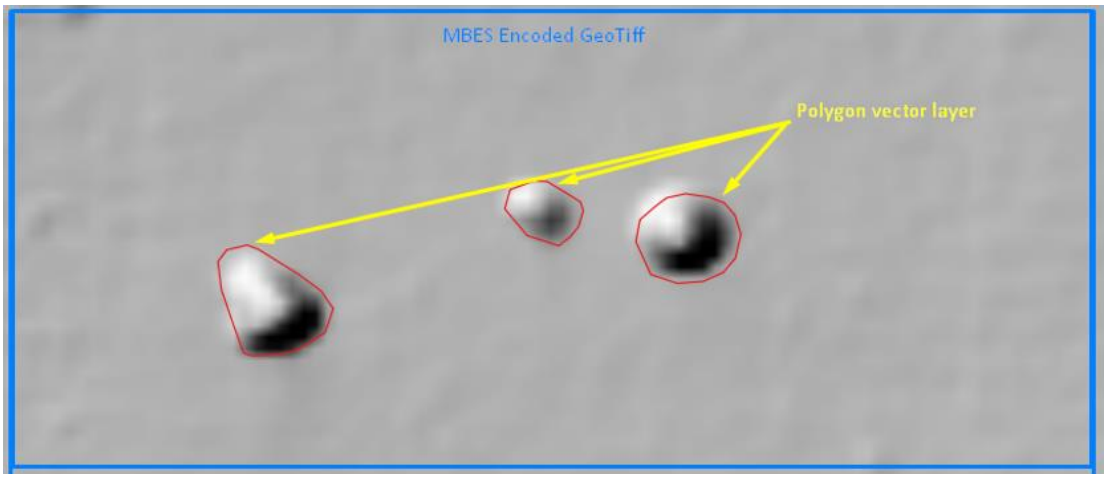
In order to gain the best possible insight into the skills of the applicants and ensure accurate evaluation, we have designed the following task. Task presents a specific problem that requires writing a concise and straightforward script using the Python programming language. The script should produce the intended output for the given task and be compatible with the QGIS 3.28 software. In order to get the best possible insight into the data and be able to test your ideas, we are sending you the test data for the task. Alongside the developed script, it is essential to submit a Word document detailing the methodology and procedures involved in its creation, explaining how the script functions, and providing instructions for testing and usage.

Task 1. Boulder dimension calculation

One of the most time-consuming tasks in processing of MBES data is the detection of boulders, i.e. stones on the seabed. Along with determining their positions, it is also necessary to calculate three key dimensions for each boulder: length, width, and height. Extensive efforts have been dedicated to the development of tools for automated boulder detection in MBES data. Although these tools have reached a relatively advanced stage and exhibit a high level of accuracy, manual quality control (QC) is still required to correct errors arising from the automated detection process. During the manual QC phase, processors review the results of the automatic detection and draw polygons around the boulders that were not successfully identified. After the processor draws the polygons, a script is used to automatically measure the dimensions of the boulders. For more information on MBES sonar data, please refer to the following link: https://www.youtube.com/watch?v=_ww2PflbWD8.

The main objective of this task is to develop metodology and according it write a script that automatically measures the three dimensions of manually drawn boulders and generates a target list. The script should utilize two input data layers:

1. A vector layer in SHP format containing polygons that approximate the shape of the boulders. No additional attribute fields are required, only the polygon geometry. The polygons should accurately outline the contours of the boulders.
2. A gridded surface of bathymetric average values encoded in GeoTiff format (32-bit floating point samples for elevation). The file extension must be .tif. The depths can be either positive or negative.



The output of the script should be as follows:

- A vector layer in SHP format with points that approximate the centroids of the input boulder polygons.
- Each point should have the following attribute fields: Poly_ID, Target ID (which should contain the value "MBES" and include the block name and target order number), Block (the user should provide a value for this field in the initial script settings), Easting, Northing, Water depth (the water depth at the location of the boulder centroid), Length (the largets distance within the boulder polygon), Width (the distance within the polygon perpendicular to the length), and Height (the difference in the depth of the seabed around the boulder and the highest point of the boulder). The unit of measurement is meters.
- The script will store the output layer in the same folder as the input vector layer.

	Poly_ID	Target ID	Block	KP	DCC	Easting	Northing	WaterDepth	Length	Width	Height
1	0	MBES_02_00	B02	NULL	NULL	407157.2099526...	5999734.115813...	-3.79081630706...	1.646146796340...	1.149394882353...	0.548903942108...
2	1	MBES_02_01	B02	NULL	NULL	407160.7171104...	5999735.286183...	-4.11220169067...	1.005574250934...	0.75885924755987	0.246461868286...
3	2	MBES_02_02	B02	NULL	NULL	407162.5607383...	5999734.940271...	-3.73085355758...	1.349566773186...	1.132609782382...	0.613431930541...