The classification of terrain forms is the division of the Earth's surface into different geomorphological units, such as lowlands, highlands, valleys or hills. This is a key research issue, not only in the field of geomorphology, but also in soil science, hydrology and environmental remote sensing. The correct determination of terrain forms is an essential task in understanding and describing the topographic features of the terrain and the process of their formation. However, this is not a trivial due to the complexity and diversity of environmental processes taking place. Moreover, terrain forms are not discrete (homogeneous), but rather continuous, changing temporarily.

The traditional approach to the classification of terrain forms was based on the interpretation of the topographic maps and aerial photographs. However, this method is extremely inefficient, requires a lot of work and the involvement of experienced geomorphologists. As a consequence, the results of the area classification may be different (non-reproducible) depending on the chosen methodology.

With the increase in the amount of data acquired remotely (e.g. multispectral satellite images or laser scanning) and the development of digital data processing methods, there is a growing emphasis on the automation of data processing. An important issue is the effectiveness of such solutions, and more specifically, compliance with the current state of knowledge because the result of studies must be reproducible, acceptable and understandable to potential users.

Computer vision can be a tool supporting (or even replacing) the geomorphological mapping process. Compared to the traditional method, the advantages of the proposed approach are high efficiency (possibility to classify the whole world in any spatial scale), use different morphological features (textures, shapes, sizes) and, most importantly, full repeatability of results.

The project will use an innovative approach based on deep learning of neural networks for geomorphological mapping, which has a very solid foundation in image analysis and is widely used with great success in solving perceptual problems. We assume that the application of this method will overcome the limitations of currently used methods and the conclusions of the research will cover the existing gaps in domain knowledge taking into account the interpretation of computer vision, spatial error distribution and the significance of geomorphological features.

The aim of the project is to propose a methodology for developing geomorphological maps (presenting the classification of terrain forms) using modern computer vision methods, in particular deep learning of neural networks.

The results in the form of a static and interactive map will be publicly available, so anyone interested can use. The availability of our results will have a significant role not only in the field of geomorphology, but also in related fields. The thematic maps are the fundamental material in environmental sciences and are a source for further studies. The following areas may benefit: soil science (similarity zones conditioning soil-forming processes), precision agriculture (identification of Soil Management Zones, i.e. areas with similar plant growth conditions), forestry (development of soil-habitat surveys for forest management planning) or environmental monitoring (topographical conditions of pollution migration).