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UNet-based Segmentation of 3D Volumetric microtomography geological samples

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Convolutional Neural Networks (CNNs) have emerged as powerful tools in the field of computer vision, demonstrating remarkable capabilities in tasks such as image classification, object detection, and semantic segmentation. Traditional CNNs are primarily designed for processing two-dimensional 2D images. However, many applications, such X-ray tomography and microtomography, involve volumetric data in the form of 3D images. X-ray microtomography in turn is a non-destructive imaging technique that makes use of X-rays for obtaining high-resolution, three-dimensional visualization of the internal structures of small objects. This work explores the use of CNNs, specifically focusing on the utilization of 2D-UNet and 3D-UNet architectures since these networks usually rank high among the best performing networks for the segmentation tasks. The objective is to perform semantic segmentation, dissecting the various phases present in 3D microtomography images of geological samples. An objective comparison between the predicted results and ground truth is presented.

Primary author: HARO FERNANDEZ, Diego bladimir (unical)

Co-authors: Dr PRASEK, Marco (Elettra); Dr BALEN, Drazen

Presenter: HARO FERNANDEZ, Diego bladimir (unical)

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