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Use of a UNet network for the identification of cavities inside mines

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Muon radiography is a technique that utilizes muons from cosmic rays to investigate otherwise hard-to-reach environments. This technique offers several advantages, including the absence of accelerators to generate particles that interact with the target under examination. It is a non-invasive technique, both for humans and the observed object. Furthermore, due to the muons' ability to penetrate dense materials over long distances, it is suitable for studying large structures such as mines, hills, and pyramids, as well as highly dense materials like radioactive waste containers and blast furnaces.
This study presents an application of this technique to the Temperino mines.
Typically, cavity detection using muon radiography is based on a visual method. This work demonstrates how, through the use of a UNet neural network, cavities can be detected and delineated. This allows you to define a percentage of precision in the detection of these voids, moving from subjective to objective identification. Additionally, more detailed information about their shape and size is available.
The combination of muon radiography with the use of a UNet neural network demonstrates its significant potential as a tool for subsurface exploration and geological studies, providing a more accurate and reliable approach for detecting and characterizing voids.

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