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Deep Learning Strategies for Target Classification via Tomographic Ground Penetrating Radar

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Subsurface and underground exploration and monitoring are of interest for several applications which span from geoscience and archaeology to security and safety areas [1, 2]. In the framework of non-destructive testing, ground penetrating radar (GPR) represents a valuable technology that has been extensively exploited for the detection and characterization of buried objects. Nevertheless, this remote sensing modality has some limitations related to the generated output, since these images of the underground require an expert user for their interpretation. Moreover, identifying and characterizing buried objects still represent a non-trivial task [3].

To this aim, several algorithms have been developed to face the aforementioned issues efficiently and automatically. In this context, approaches based on deep learning and convolutional neural networks (CNNs) have been proposed in the past years and recently gained a lot of attention by the scientific community [4]. Despite their efficiency, these approaches require many cases to perform the training step and improve their classification performance.

In this abstract, the case of a multistatic GPR system is considered via two-dimensional numerical simulations to classify the kind of underground utility automatically in areas in which both water and natural gas pipes can be located. More in detail, some discussions on the classification performance by adopting different topologies and network architectures will be dealt with.

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