

Convolutional Neural Networks to improve the interpretation of archaeological prospection data collected with Ground Penetrating Radar

Merope Manataki

Abstract

Ground Penetrating Radar (GPR) is an EM geophysical technique suitable to map ancient buried structures in the near-surface, contributing greatly to archaeological prospection. However, the data interpretation is challenging, time-consuming, and prone to mistakes. The subsurface can create non-intuitive patterns, making the identification of the buried targets uncertain. Hence, archaeological remains may be bypassed or mistaken for other types of features. Further, residual noise often exists in the data that can easily be mistaken as structural remains. In this study, the potential of Convolutional Neural Networks to aid data interpretation is examined. More specifically, AlexNet architecture is used to classify GPR C-scans. The latter are 2D images derived from slicing pseudo-3D volumes that can be constructed when collecting data using survey grids. Due to the lack of available training data set, the emphasis is given on dataset construction to classify patterns identified as noise, ancient structure, and subsurface features unrelated to the archaeological context. The data used were collected from several archaeological sites, through extensive geophysical surveys, with most of them taking place in Greece. Further, popular techniques and methods to improve training performance and generalization are also applied, compared, and discussed, providing useful insights for future research directions and improvements.