Politecnico di Torino

Honors Thesis

Master's Degree Architecture for Sustainability.

Abstract

3D digital documentation of the Pompeii archaeological site in Italy using geomatic surveying and analysis with applications of AI technique - The submerged and underground environment in Regio II.

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This thesis investigates the enhancement of geomatic survey and analysis through the integration of artificial intelligence (AI) for the digital documentation of archaeological heritage, with particular emphasis on submerged and underground environments. Building on the interdisciplinary foundations of archaeology and the established application of remote sensing technologies, the research addresses the contemporary demand for innovative, non-invasive, and sustainable documentation methodologies, in accordance with the principles set forth by the Faro Convention. A series of case studies conducted in Pompeii's Regio II—specifically the Amphitheatre, the Domus of Riti Magici, and the Praedia of Julia Felix—serve to evaluate the application of advanced geomatic techniques, including multispectral UAV photogrammetry, lidar scanning, and Mobile Mapping Systems (MMS). The study further explores the incorporation of machine learning algorithms for the segmentation and classification of 2D imagery and 3D point cloud data, aiming to enhance analytical precision, reduce labor-intensive processes, and facilitate the interpretation of complex archaeological datasets. The results substantiate the potential of AI-driven methodologies to significantly advance the efficiency, accuracy, and depth of archaeological documentation and analysis. Additionally, the thesis critically examines the challenges and limitations encountered during implementation and proposes directions for future research and technological development in the field. By contributing to the advancement of sustainable and digitally enhanced practices, this research supports the broader objective of safeguarding and valorizing cultural heritage through innovative technological solutions.

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