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Cultural heritage monument complex monitoring data analyses using machine learning algorithms

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Cultural heritage monuments, that were created by mankind for centuries are scattered throughout the world. Most of them are experiencing impacts coming from nature and humans each year that result in damage and changing their common state. Many of the monuments are facing critical conditions and require diagnostics, study and planning and management of conservation/rehabilitation works. Due to the impact of environmental factors such as temperature, humidity, precipitation, the existence of complex structure of cracks, infiltrated water and runoff water streams, together with active tectonics in the region, Uplistsikhe and Vardzia rock-cut city monuments located in Georgia face problems and permanent destruction.

We have developed continuous monitoring systems that are installed in Vardzia and Uplistsikhe.

These systems are generating large amounts of data and it is almost impossible to analyze this data using conventional methods. In parallel with technological development, it is now possible to analyze big data using machine learning. We decided to use machine learning to address our problem. This approach gave us some interesting results. We were able to detect correlations between different sensors, see anomalies in data that gave us some clues about hazard zones. Additionally models and predictions about the monument's condition were made.

Our work shows that machine learning could be used to estimate conditions make predictions about monuments state.

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