

EXPLOITATION OF BIG DATA CLOUD INFRASTRUCTURES FOR EARTH OBSERVATION CULTURAL HERITAGE APPLICATIONS: MAPPING THE LAND USE CHANGES PATTERNS IN THE VICINITY OF “THE GREAT PYRAMID AT GIZA”

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ABSTRACT: The current availability of the Sentinel images provided in the framework of the Copernicus programme as well as other freely distributed satellite data such as Landsat series may offer further potentials and services for cultural heritage sector. Private and public big data cloud infrastructures have been working in this direction in order to deliver multi-petabyte catalogues of geospatial earth observation datasets for planetary-scale analysis capabilities. In this study, the Earth Engine[®], a computing platform which runs using Google’s infrastructure, has been exploited in order to map land use changes patterns in the vicinity of “The Great Pyramid at Giza”, Egypt, an UNESCO World Heritage site. Multi-temporal radiometric ready calibrated products earth observation datasets have been used for the last two decades, while various advance supervised classification algorithms have been applied. The latest include among other the Random Forest, Fast Naive Bayes, Voting Support Vector Machine (SVM), Margin SVM and GMO Max Entropy classifiers. Training data have been collected and three main classes have been created: urban, soil and vegetation land use types. The classification was applied in a fused annual dataset product, while classification statistics and accuracy assessment was also possible to be performed in the platform. The platform provided almost in real time the classification result. The overall result indicated the dramatic land use change in the western part of the UNESCO World Heritage site, as a result of the urban pressure in the area. Big data engines can be used as a robust platform for earth observation multi-temporal analysis for cultural heritage applications.