

## Abstract

The Server-Based Unified Thematic Geological Mapping of Makran (SUTGMM) is a comprehensive geospatial study conducted at a scale of 1:50,000, focusing on the Makran region, located in southeastern Iran along the northern margin of the Oman Sea. This region is characterized by diverse geological formations resulting from the collision of the Arabian and Eurasian plates, including volcanic and sedimentary sequences, turbidite basins, and Quaternary deposits. Makran's rich geological heritage, coupled with its historical importance, makes it a prime subject for advanced geoscientific research and mapping.

Utilizing a novel approach combining cloud computing, machine learning, and object-based image analysis, the project leverages the power of Google Earth Engine for the processing and analysis of large datasets. The random forest algorithm, used for geological classification, has enabled the creation of a unified geological map with an accuracy of 85%, highlighting the effectiveness of this integrated approach.

This project has provided valuable insights into the complex geological context of the Makran region. The geological units mapped in SUTGMM represent a time range from the Oligocene to the Quaternary period. This includes older formations from the Oligocene and Miocene, as well as more recent Pleistocene and Quaternary deposits. The units highlight the region's complex geodynamic evolution, influenced by both tectonic activity and sedimentary processes.

The GeoNexus geodatabase, as the final product of the SUTGMM project, represents a major advancement in geological mapping by using cloud computing, machine learning, field surveys, and multi-source data integration to enhance the accuracy, efficiency, and comprehensiveness of geological outputs. Ultimately, the findings from this study are expected to support sustainable development efforts and foster a deeper understanding of the Makran region's geodynamic processes.



## Geological Mapping in the Era of AI: Leveraging Innovation for Precision and Speed



ISBN : 978-622-8423-35-7



2025

UCCGHA 033

2025