Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.14102

Identifying Multivariate Geochemical Anomalies Using Deep Learning Auto-encoders with Compositional and Classical Vision Approaches, Lut Block Polymetallic Belt, Iran

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The Lut Block polymetallic belt in Eastern Iran is known for its diverse mineral deposits, making it an important area for mineral exploration. In this study, we investigate the use of deep learning autoencoders for multivariate anomaly detection in stream sediment geochemical data analysis of the Lut Block, using two different approaches: compositional (closed data) and classical vision. To perform multivariate anomaly detection, we trained deep learning autoencoder models on a dataset of stream sediment geochemical data from the Lut Block. The first model was trained using the compositional approach, which assumes that the data is compositional and therefore must sum to a constant. The second model was trained using a classical vision approach, which does not make any assumptions about the data. The results show that both models were able to identify areas with geochemical anomalies, which may indicate the presence of mineral deposits. However, the results from the compositional approach showed a higher level of accuracy compared to the classical vision approach. In conclusion, this study demonstrates the potential for deep learning autoencoders to be used in stream sediment geochemical data analysis for mineral exploration. The results from this study provide valuable tools for identifying areas of potential mineral deposits in the Lut Block and have the potential to support future exploration efforts in this region. Additionally, the study highlights the importance of considering the appropriate data assumptions when applying deep learning techniques in mineral exploration.