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HYPERSPECTRAL IMAGING AND GNN FOR AS AND HEAVY METAL DETECTION

DIP ACHARYA[1]* AND SUBRATA SINHA[1]

Water and soil pollution with arsenic and other heavy metals poses significant risks to public health and environmental sustainability. Traditional chemical analysis methods, while accurate, are time-consuming, invasive, and unsuitable for large-scale or real-time monitoring. Hyperspectral imaging (HSI) emerges as a promising non-invasive technique, capturing detailed spectral patterns useful for detecting heavy metal contamination. However, the high dimensionality of HSI data and complex spatial–spectral correlations challenge conventional machine learning approaches. This paper proposes a novel method using graph neural networks (GNNs) for precise identification of arsenic and heavy metal pollution. In this approach, hyperspectral image pixels serve as graph nodes, edges represent spatial and spectral similarities, and deep learning-extracted spectral features are classified via GNNs to model dependencies and enhance detection accuracy.