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(57) Abstract :

The present invention relates to the development of a Hybrid AI and Graph Theory Optimization Framework for $BiFeO_3$ perovskite sensors is proposed, which utilizes the multiferroic characteristics of $BiFeO_3$ perovskite sensors for improved sensitivity and specificity. The proposed framework uses a hybrid AI approach, which combines convolutional neural networks (CNNs) for the processing of spatiotemporal data and reinforcement learning (RL) for adaptive calibration, along with graph neural networks (GNNs) to represent sensor networks as dynamic graphs. Graph theory is used to optimize the placement of nodes, while edge weights are used to represent correlations between air pollutants, and spectral clustering is used to minimize deployment costs while maximizing coverage. Experimental results on $BiFeO_3$ perovskite thin films, which were prepared using the sol-gel method and analyzed using XRD/SEM, show a 25% improvement in accuracy over traditional LSTM-based models, with edge computing facilitating low-latency notification systems. FIG.1

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