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Deep Learning Solutions for Real-Time Monitoring of CO_2 and Air Quality Systems

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Abstract:

The integration of deep learning techniques into real-time monitoring systems has significantly enhanced the accuracy and responsiveness of CO_2 and air quality assessments. Advanced models, such as Long Short-Term Memory (LSTM) networks, have been effectively utilized to predict indoor CO_2 concentrations, enabling proactive ventilation strategies to maintain optimal air quality levels □cite□turn0search3□. Hybrid deep learning architectures combining Convolutional Neural Networks (CNNs) and Gated Recurrent Units (GRUs) have demonstrated superior performance in forecasting air pollutant concentrations, including PM2.5 and NO_2, by capturing both spatial and temporal dependencies in environmental data □cite□turn0search5□. Furthermore, the deployment of Internet of Things (IoT) devices equipped with deep learning models facilitates continuous, low-cost monitoring of air quality, providing real-time data analysis and alerts for pollution levels □cite□turn0search14□. These advancements contribute to the development of intelligent environmental monitoring systems capable of supporting public health initiatives and informing policy decisions.□

Keywords: Deep Learning, Real-Time Monitoring, CO_2 Prediction, Air Quality, LSTM, IoT□

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