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# Advanced Neural Network-Based Optimization for Antenna Design in IoT and Smart Cities Applications

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**Abstract:**

Efficient antenna design is a critical factor in enhancing communication performance for IoT devices within smart city infrastructures. This study introduces an advanced neural network-based optimization framework aimed at improving antenna design parameters such as gain, directivity, bandwidth, and radiation efficiency. Using supervised learning techniques, the model is trained on a large dataset of antenna configurations and performance metrics, enabling accurate prediction and optimization of antenna behavior. Deep neural networks (DNNs) are employed to explore the design space and identify optimal configurations tailored to IoT communication requirements. The framework supports rapid prototyping and reduces computational complexity in the design process. Experimental evaluations demonstrate that the proposed method achieves superior performance compared to traditional optimization techniques, offering scalable and energy-efficient antenna solutions suitable for dense urban environments and next-generation smart city networks.

**Keywords:**

Antenna design, neural networks, IoT, smart cities, optimization, wireless communication.

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