

Smart Optimization of Antenna Structures Using Machine Learning in Wireless Systems

Abstract:

The rapid evolution of wireless communication systems demands high-performance antenna designs that can adapt to dynamic requirements such as higher data rates, reduced latency, and improved energy efficiency. Traditional antenna design and optimization methods, though effective, are often time-consuming and computationally intensive. It explores the application of machine learning (ML) techniques for the smart optimization of antenna structures in wireless systems. By leveraging ML algorithms such as neural networks, genetic algorithms, and reinforcement learning, antenna parameters can be intelligently tuned to achieve optimal performance metrics including gain, bandwidth, and radiation efficiency. The study also highlights the integration of simulation data with ML models to predict and enhance antenna behavior under varying conditions. Experimental results demonstrate significant improvements in design accuracy and speed compared to conventional approaches. This work underscores the potential of machine learning to revolutionize antenna engineering, offering scalable and adaptive solutions for next-generation wireless networks.