

The Neural Revolution in Solar Energy: Prediction, Control, and Optimization

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The use of artificial neural networks in the technological evolution of photovoltaic solar energy represents a significant advancement in the efficiency and reliability of this renewable energy source. Artificial neural networks, inspired by the human brain's structure, have found applications in various aspects of the photovoltaic solar system lifecycle, ranging from energy generation prediction to operational control and performance optimization. Accurate prediction of solar energy generation is paramount for the efficient integration of this source into the electrical grid. Neural networks are adept at analyzing historical data on solar radiation, temperature, and other meteorological variables to provide reliable forecasts of energy production, enabling proper planning and the maximization of solar energy utilization. Furthermore, neural networks are employed in the control of solar tracking systems, optimizing panel orientation to track the sun's movement and maximize incident sunlight capture. They also play a vital role in managing energy storage systems, determining when to store or release energy to meet demand in the most efficient manner possible. These applications not only enhance the efficiency of photovoltaic systems but also contribute to grid stability, facilitating the transition to clean energy sources. The ongoing evolution of neural networks and their integration with photovoltaic solar energy promises to play a central role in building a more sustainable and energy-efficient future.

Keywords: Neural Networks; Solar Energy; Efficiency.

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