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(57) Abstract :
 ADAPTIVE SMART GRID OPTIMIZATION FRAMEWORK LEVERAGING DECENTRALIZED AI AND PREDICTIVE IOT ANALYTICS ABSTRACT The present invention relates to an adaptive smart grid optimization system leveraging decentralized artificial intelligence (AI) and predictive IoT analytics to enhance the efficiency and stability of modern energy grids. The system includes IoT sensors distributed across the grid to collect real-time data on energy consumption, generation, and environmental conditions. A decentralized AI module processes this data using machine learning algorithms, predicting energy demand and supply imbalances. Based on these predictions, a control unit generates optimization strategies, such as load balancing and energy distribution adjustments, without relying on centralized control. The system utilizes a communication network to transmit data seamlessly between components, ensuring real-time decision-making. Additionally, an adaptive feedback module continuously refines the optimization strategies by analyzing their effectiveness, enabling dynamic, self-improving grid management. This invention aims to optimize energy distribution, integrate renewable energy sources, and enhance fault detection and mitigation, contributing to a resilient and energy-efficient smart grid.

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