Smart Power Grid Control: Artificial Intelligence-Based Fault Detection in Power Transmission Systems

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Modern electrical systems rely heavily on sensors and relays for fault detection in three-phase transmission lines and distribution transformers. However, these devices often suffer from high time complexity and are prone to false alarms, struggling to differentiate between actual faults and erroneous signals. This research addresses these limitations by developing a deep learning model aimed at enhancing fault prediction capabilities. The study utilized a simulated dataset representing a three-phase transmission line to enrich training data for a neural network. The methodology involved constructing and training a deep learning model to accurately predict faults, contrasting its performance against traditional sensors and relays. The findings indicate that the neural network achieved higher accuracy in fault detection compared to conventional methods. Furthermore, the integration of machine learning algorithms into electrical systems promises a more robust and reliable fault detection mechanism, reducing false alarms and improving operational efficiency. This study underscores the potential of machine learning technologies to transform fault diagnostics in electrical power systems, paving the way for more advanced monitoring solutions.

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