Convolutional Adversarial Neural Network (CANN) for Fault Diagnosis within a Power System : Addressing the Challenge of Event Correlation for Diagnosis by Power Disturbance Monitoring Equipment in a Smart Grid

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Abstract

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Abstract:
Fault diagnostics have become a primary concern within the domain of power system engineering, particularly for distribution utilities. Early and accurate fault diagnostics within a power system is crucial for power outage mitigation. The classical approaches for fault diagnostics are limited to the checking of some measurable output variable, the actual fault location, and the historical data related to the involved real-time applications pertaining to power disturbance monitoring equipment and other elements of the grid. A new approach for fault diagnosis within the power system network, based upon Convolutional Adversarial Neural Networks (CANNs), is presented within this paper. The discussed approach vector combines the properties of Generative Adversarial Networks (GANs) with Convolutional Neural Networks (CNNs) for a hybridized architectural approach. The resultant CANN approach better contends with the complexity of a power system network as well as more robustly identifies incorrect or missing [individual] faults as well as multiple-fault events for enhanced fault diagnostics. The results indicate that the posited CANN approach is more successful in the diagnosis of simultaneous faults as well as better anticipates the problems at the nexus of transmission and distribution system preceding and amidst a power outage. Moreover, the posited approach more robustly addresses the challenge of event correlation for proper diagnosis by disturbance monitoring equipment and other grid stability/resiliency monitoring systems within an electrical grid.

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