

Why is deep learning important for smart grid self-healing & fault mitigation?

Effective fault detection, classification, and localization are vital for smart grid self-healing and fault mitigation. Deep learning has the capability to autonomously extract fault characteristics and discern fault categories from the three-phase raw data of voltage and current signals.

Is autonomous smart grid fault detection possible?

A case study is introduced as a preliminary study for autonomous smart grid fault detection. In addition, we highlight relevant directions for future research. Smart grid plays a crucial role for the smart society and the upcoming carbon neutral society.

Can deep neural networks improve smart grid reliability?

A study introduced a deep neural network (ANN and CNN)-based approach for detecting and isolating faults in microgrids without the need to shut down the entire system. These algorithms have the potential to improve the reliability and efficiency of smart grids [28,29,30].

Why is localization and classification important in smart grid?

Localization, classification, and fault detection are essential for addressing any problems immediately and resuming the smart grid as soon as possible. Simultaneously, the capacity to swiftly identify smart grid issues utilizing sensor data and easily accessible frequency and voltage data from PMU devices is a prerequisite of this task.

What are fault detection and classification techniques?

Fault detection, classification, and location techniques can be either data-driven or model-driven, as noted in [16,17]. Data-driven techniques use data mining and machine learning algorithms to analyze large amounts of data to detect and classify faults.

What is transmission line fault detection & classification?

Transmission line (TL) fault detection and classification are crucial to fault root cause analysis and quick power grid recovery. Fault analysis has benefited greatly from the use of deep learning due to its ability to automatically extract representative features from large datasets.

This manuscript addresses the critical challenge of fault classification and localization within smart distribution networks, exacerbated by the complex integration of distributed energy resources and the dynamic nature of modern power systems. Traditional methods fall short in accurately and efficiently managing these tasks due to their reliance on ...

Request PDF | Faults in smart grid systems: Monitoring, detection and classification | Smart Grid (SG) is a multidisciplinary concept related to the power system update and improvement. SG implies ...

A brief summary of faults in smart grid infrastructure is provided by Hlalele et al. . They distinguish between faults related to power distribution, photovoltaic and wind turbines and outline possibilities of the fault identification. ... Poor HV, Tajer A (2012) Coordinated data-injection attack and detection in the smart grid: a detailed look ...

The power grid faults model is paramount to discriminate faults from standard functioning states. The protection schemes for SG and Micro-SGs (u SGs) consider the concept of Internet-of-Energy (IoE) [3], [4] utilized for the operation and coordination of protection to obtain an efficient and dynamic infrastructure.

ABSTRACT Fault detection and location give to smart grid the ability to self-healing and isolating the fault in order to limit the negative consequences. In the literature, several techniques are proposed for detection and classification of faults using artificial intelligence algorithms. This paper proposes a novel method using fuzzy logic and neural networks for ...

An Efficient LoRa-Enabled Smart Fault Detection and Monitoring Platform for the Power Distribution System Using Self-Powered IoT Devices January 2022 IEEE Access 10:1-1

Abstract: Timely detection of electrical faults is of paramount importance for efficient operation of the smart grid. To better equip the power grid operators to prevent grid-wide cascading failures, the detection of fault occurrence and its ...

diagnosis, heterogeneous multi-task learning, smart grid. I. INTRODUCTION Fault diagnosis is a crucial task for the operation and maintenance of power systems, particularly in distribution ... GNN architecture that is capable of performing fault detection, fault localization, fault type classification, fault resistance

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To better equip the power grid operators to prevent grid-wide cascading failures, the detection of fault occurrence and its type must be accompanied by accurately locating the fault. In this work, we propose a multi-task learning architecture ...

Researchers in [28] introduced a fault detection technique using tunable photon counting (?-OTDR) to identify fiber optics faults in PONs. This method filters out and reduces the coherent noise and enhances fault detection through a feedback loop linking a Field-Programmable Gate Array (FPGA) based acquisition unit and the filter.

Under the implementation of current hardware of the grid, faults appear frequently in routing nodes and require effective detection. This paper achieves accurate locating and isolation through the efficient detection

of faults. Experiments show that it could not only improves the low detection rate and poor fault location accuracy of the current method, but ...

1.2 . Figure 1.1. Grid Fault Taxonomy. Traditional fault detection (basic over-current detection) and analysis are performed from measurements mostly made at the substation and in some systems, with pole-top devices such as smart switches and

This article proposes a deep learning (DL) model made of Long Short Term Memory (LSTM) and Adaptive Neuro Fuzzy Inference System (ANFIS) to detect fault in smart distribution grid assisted by communication systems using smart meter data. In smart grid, data analysis for fault identification and detection is crucial for grid monitoring.

Achieving autonomous smart grid fault detection is critical for smart grid system state awareness, maintenance and operation. This paper focuses on fault monitoring in smart grid and discusses the ...

Recent works related to fault detection in WSN based smart grid environments are mentioned . below . Arifa et al. [21] proposed a wireless sensor based smart grid by using cognitively driven load .

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While Machine Learning approaches have been applied in smart grids for fault detection, the robustness and security of these systems need thorough exploration. ... Thanks to the advancements in the field provided by the smart grid, several data-driven approaches have been proposed in the literature to tackle fault prediction tasks. Implementing ...

This paper proposes two machine learning approaches based on the binary classification to improve the process of fault detection in smart grids. Besides, it presents four machine learning models trained and tested on real and modern fault detection data set designed by the Technical University of Ostrava. ... AND LOCATION IN SMART GRID 2955 The ...

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This survey presents a structured review of the existing research into some common AI techniques applied to load forecasting, power grid stability assessment, faults detection, and security ...

Smart grid monitoring in IoT environments demands robust fault tolerance mechanisms to ensure uninterrupted operation and data accuracy. The integration of advanced machine learning with fault-tolerant strategies in the proposed Intelligent FaultEdge framework represents a significant innovation. Unlike traditional reactive systems, Intelligent FaultEdge adopts a proactive ...

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Fault detection and identification are critical tasks in maintaining the reliability and stability of the energy grid. The timely detection of faults and accurate identification of their locations ...

Keywords: fault classification, fault detection, fuzzy logic, smart meter data, smart grid ©The Author("s). This is an open access article distributed under the terms of theCreative Commons Attribution License (CC ... In a smart grid, faults are detected by analyzing the shape of voltage, current and phases. That is why in [14], the authors ...

Fault Detection Method for Smart Grid. January 2014; Conference: National Conference on Power systems, Embedded systems, Power electronics, Communication, Control and Instrumentation- PEPCCI-2014 ...

Recently, anomaly detection of the smart grid has attracted a large amount of interest from researchers, and it is widely applied in a number of high-impact fields. One of the most significant challenges within the smart grid is the implementation of efficient anomaly detection for multiple forms of aberrant behaviors.

The fault diagnosis and control through fault detection, isolation and supply restoration (FDIR) technique is the part of a commonly used distribution management system application in smart grid ...

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