

Review

Review on Artificial Intelligence-Based Fault Location Methods in Power Distribution Networks

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Abstract: This paper provides a comprehensive and systematic review of fault localization methods based on artificial intelligence (AI) in power distribution networks described in the literature. The review is organized into several sections that cover different aspects of the methods proposed. It first discusses the advantages and disadvantages of various techniques used, including neural networks, fuzzy logic, and reinforcement learning. The paper then compares the types of input and output data generated by these algorithms. The review also analyzes the data-gathering systems, including the sensors and measurement equipment used to collect data for fault diagnosis. In addition, it discusses fault type and DG considerations, which, together with the data-gathering systems, determine the applicability range of the methods. Finally, the paper concludes with a discussion of future trends and research gaps in the field of AI-based fault location methods. Highlighting the advantages, limitations, and requirements of current AI-based methods, this review can serve the researchers working in the field of fault location in power systems to select the most appropriate method based on their distribution system and requirements, and to identify the key areas for future research.

Keywords: fault location; artificial intelligence; power distribution networks



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1. Introduction

Following to a short-circuit fault in distribution networks, the fault should be located and isolated before restoring the supply. A fast and accurate fault location method can help to improve the continuity of supply considerably. In general, the distribution-network fault location methods can be categorized into impedance-based methods, state estimation-based methods, traveling wave-based methods, and artificial intelligence-based (AI-based) methods.

The impedance-based methods determine the location of faults by measuring the apparent impedance seen from one or more measurement points. These methods estimate the fault location by comparing the measured impedance for the probable fault paths in the network with the measured one [1–5]. These methods can provide fault location estimations with acceptable accuracy, although they might estimate several candidate locations in the networks with several laterals. They require detailed data about the network topology, line impedances, and loads and are, hence, very sensitive to network-model inaccuracies.

State estimation-based methods consider a fault as bad data and try to locate it using the data collected from different measurement points of the network [6–8]. Similar to the impedance-based methods, these techniques need the distribution-network data. While they are less sensitive to input data inaccuracies, they can only be applied to networks with considerable measurement infrastructures.

Traveling wave-based methods estimate the fault location by calculating the sweep duration of the wave traveling from the measurement point to the fault location [9–12].

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Table of Contents Review Of Fault Location Methods For Distribution Power System

1. Understanding the eBook Review Of Fault Location Methods For Distribution Power System
 - The Rise of Digital Reading Review Of Fault Location Methods For Distribution Power System
 - Advantages of eBooks Over Traditional Books
2. Identifying Review Of Fault Location Methods For Distribution Power System
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Review Of Fault Location Methods For Distribution Power System
 - User-Friendly Interface
4. Exploring eBook Recommendations from Review Of Fault Location Methods For Distribution Power System
 - Personalized Recommendations
 - Review Of Fault Location Methods For Distribution Power System User Reviews and Ratings
 - Review Of Fault Location Methods For Distribution Power System and Bestseller Lists
5. Accessing Review Of Fault Location Methods For Distribution Power System Free and Paid eBooks

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- Review Of Fault Location Methods For Distribution Power System Public Domain eBooks
 - Review Of Fault Location Methods For Distribution Power System eBook Subscription Services
 - Review Of Fault Location Methods For Distribution Power System Budget-Friendly Options
6. Navigating Review Of Fault Location Methods For Distribution Power System eBook Formats
 - ePub, PDF, MOBI, and More
 - Review Of Fault Location Methods For Distribution Power System Compatibility with Devices
 - Review Of Fault Location Methods For Distribution Power System Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Review Of Fault Location Methods For Distribution Power System
 - Highlighting and Note-Taking Review Of Fault Location Methods For Distribution Power System
 - Interactive Elements Review Of Fault Location Methods For Distribution Power System
 8. Staying Engaged with Review Of Fault Location Methods For Distribution Power System
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Review Of Fault Location Methods For Distribution Power System
 9. Balancing eBooks and Physical Books Review Of Fault Location Methods For Distribution Power System
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Review Of Fault Location Methods For Distribution Power System
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Review Of Fault Location Methods For Distribution Power System
 - Setting Reading Goals Review Of Fault Location Methods For Distribution Power System
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Review Of Fault Location Methods For Distribution Power System
 - Fact-Checking eBook Content of Review Of Fault Location Methods For Distribution Power System
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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