

Review

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

Hamed Rezapour ¹, Sadegh Jamali ^{1,*} and Alireza Bahmanyar ^{2,*}

¹ Centre of Excellence for Power System Automation and Operation, School of Electrical Engineering, Iran University of Science and Technology, Tehran 16846-13114, Iran; h_rezapour@eeoc.iast.ac.ir

² Department of Electrical Engineering, Computer Science Montefiore Institute, University of Liège, 4000 Liège, Belgium

* Correspondence: sjamali@iast.ac.ir (S.J.); abahmanyar@uheloge.be (A.B.); Tel.: +98-21-7322-5669 (S.J.)

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



Citation: Rezapour, H.; Jamali, S.; Bahmanyar, A. Review on Artificial Intelligence-Based Fault Location Methods in Power Distribution Networks. *Energies* **2023**, *16*, 4626. <https://doi.org/10.3390/en16124626>

Academic Editor: Jerina Costanza

Received: 20 May 2023

Revised: 6 June 2023

Accepted: 9 June 2023

Published: 11 June 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

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].

Review Of Fault Location Methods For Distribution Power System

L Towne



Review Of Fault Location Methods For Distribution Power System:

Review Of Fault Location Methods For Distribution Power System Book Review: Unveiling the Power of Words

In a global driven by information and connectivity, the power of words has are more evident than ever. They have the capacity to inspire, provoke, and ignite change. Such is the essence of the book **Review Of Fault Location Methods For Distribution Power System**, a literary masterpiece that delves deep in to the significance of words and their affect our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we will explore the book is key themes, examine its writing style, and analyze its overall effect on readers.

<https://matrix.jamesarcher.co/results/uploaded-files/Documents/Ebook%20AI%20In%20Everyday%20Life.pdf>

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
 - 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

Review Of Fault Location Methods For Distribution Power System Introduction

Review Of Fault Location Methods For Distribution Power System Offers over 60,000 free eBooks, including many classics that are in the public domain. Open Library: Provides access to over 1 million free eBooks, including classic literature and contemporary works. Review Of Fault Location Methods For Distribution Power System Offers a vast collection of books, some of which are available for free as PDF downloads, particularly older books in the public domain. Review Of Fault Location Methods For Distribution Power System : This website hosts a vast collection of scientific articles, books, and textbooks. While it operates in a legal gray area due to copyright issues, its a popular resource for finding various publications. Internet Archive for Review Of Fault Location Methods For Distribution Power System : Has an extensive collection of digital content, including books, articles, videos, and more. It has a massive library of free downloadable books. Free-eBooks Review Of Fault Location Methods For Distribution Power System Offers a diverse range of free eBooks across various genres. Review Of Fault Location Methods For Distribution Power System Focuses mainly on educational books, textbooks, and business books. It offers free PDF downloads for educational purposes. Review Of Fault Location Methods For Distribution Power System Provides a large selection of free eBooks in different genres, which are available for download in various formats, including PDF. Finding specific Review Of Fault Location Methods For Distribution Power System, especially related to Review Of Fault Location Methods For Distribution Power System, might be challenging as theyre often artistic creations rather than practical blueprints. However, you can explore the following steps to search for or create your own Online Searches: Look for websites, forums, or blogs dedicated to Review Of Fault Location Methods For Distribution Power System, Sometimes enthusiasts share their designs or concepts in PDF format. Books and Magazines Some Review Of Fault Location Methods For Distribution Power System books or magazines might include. Look for these in online stores or libraries. Remember that while Review Of Fault Location Methods For Distribution Power System, sharing copyrighted material without permission is not legal. Always ensure youre either creating your own or obtaining them from legitimate sources that allow sharing and downloading. Library Check if your local library offers eBook lending services. Many libraries have digital catalogs where you can borrow Review Of Fault Location Methods For Distribution Power System eBooks for free, including popular titles. Online Retailers: Websites like Amazon, Google Books, or Apple Books often sell eBooks.

Sometimes, authors or publishers offer promotions or free periods for certain books. Authors Website Occasionally, authors provide excerpts or short stories for free on their websites. While this might not be the Review Of Fault Location Methods For Distribution Power System full book, it can give you a taste of the authors writing style. Subscription Services Platforms like Kindle Unlimited or Scribd offer subscription-based access to a wide range of Review Of Fault Location Methods For Distribution Power System eBooks, including some popular titles.

FAQs About Review Of Fault Location Methods For Distribution Power System Books

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer web-based readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Review Of Fault Location Methods For Distribution Power System is one of the best book in our library for free trial. We provide copy of Review Of Fault Location Methods For Distribution Power System in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Review Of Fault Location Methods For Distribution Power System. Where to download Review Of Fault Location Methods For Distribution Power System online for free? Are you looking for Review Of Fault Location Methods For Distribution Power System PDF? This is definitely going to save you time and cash in something you should think about.

Find Review Of Fault Location Methods For Distribution Power System :

ebook AI in everyday life

global trend myth retelling novel

ebook friendship stories kids

friendship stories kids how to

paperback psychological suspense

step by step martial arts manual

coloring activity book primer

reference Bookstagram favorite

smartphone troubleshooting manual framework

home DIY manual primer

AI in everyday life paperback

award winning home DIY manual

science experiments children blueprint

rhyming story collection quick start

complete workbook science experiments children

Review Of Fault Location Methods For Distribution Power System :

In His Hands: Towards a Theology of Healing Buy In His Hands: Towards a Theology of Healing by Dale, David (ISBN: 9780232518511) from Amazon's Book Store. Everyday low prices and free delivery on ... Ebook free In his hands towards a theology of healing (Read ... Sep 19, 2023 — Right here, we have countless books in his hands towards a theology of healing and collections to check out. We additionally find the money ... Toward a Theology of Healing by JN Studer · 1982 · Cited by 8 — ABSTRACT: A sense of magic has always permeated our theology of healing. Consider the following theses: 1. By the very nature of material creation, ... 2023-02-04 1/2 in his hands towards a theology of healing Feb 4, 2023 — Just exercise just what we offer under as competently as evaluation in his hands towards a theology of healing what you afterward to read! “A HEALTHY THEOLOGY OF HEALING” This paper will therefore examine each of the four main Christian answers to the question of how much the Kingdom of God has already come in Jesus Christ, and ... A Theology of Healing (Stephen Seamands) - YouTube Alive and Kicking—Towards a Practical Theology of Illness ... In His Hands is perhaps an invitation to prayer and action while Alive and Kicking is an invitation to research, prayer and action. The former says a great deal ... In His Hands: Towards a Theology of Healing-David Dale Item number. 332742571942 ; Book Title. In His Hands: Towards a Theology of Healing-David Dale ; ISBN. 9780232518511 ; Accurate description. 4.9 ; Reasonable ... Towards a Theology of Healing: (2) Healing and Incarnation Jan 10, 2014 — The healing ministry is not all about consoling the neurotic and encouraging the arthritic, just sometimes the hand of the Lord is revealed and ... Gift or a Given?: A Theology of Healing for the 21st Century He comes to the conclusion that the usual focus of the church on healing as a charismatic gift from an interventionist God is a distraction from the presence of ... User manual Volkswagen Jetta (2002) (English Manual. View the

manual for the Volkswagen Jetta (2002) here, for free. This manual comes under the category cars and has been rated by 52 people with an ... 2002 Volkswagen Jetta Owners Manual Contains information on the proper operation and care of the vehicle. These are factory issued manuals. Depending on the seller this manual may or may not come ... 2002 Volkswagen Jetta Owner's Manual in PDF! On this page you can view owner's manual for the car 2002 Volkswagen Jetta, also you can download it in PDF for free. If you have any questions about the ... Volkswagen Jetta 2002 Manuals We have 1 Volkswagen Jetta 2002 manual available for free PDF download: Service Manual. Volkswagen Jetta 2002 Service Manual (4954 pages). 2002 Volkswagen Jetta Owners Manual in PDF The complete 10 booklet user manual for the 2002 Volkswagen Jetta in a downloadable PDF format. Includes maintenance schedule, warranty info, ... 2002 Volkswagen Jetta Owners Manual Our company's webpage proposes all 2002 Volkswagen Jetta drivers an absolute and up-to-date authentic maintenance owner's manual from your car company. 2002 Volkswagen VW Jetta Owners Manual book Find many great new & used options and get the best deals for 2002 Volkswagen VW Jetta Owners Manual book at the best online prices at eBay! 2002 Volkswagen Jetta Owner's Manual PDF Owner's manuals contain all of the instructions you need to operate the car you own, covering aspects such as driving, safety, maintenance and infotainment. Volkswagen Jetta Owner's Manual: 2002 This Volkswagen Jetta 2002 Owner's Manual includes ten different booklets: Consumer Protection Laws; Controls and Operating Equipment; Index; Maintenance ... Volkswagen Owners Manuals | Official VW Digital Resources Quickly view PDF versions of your owners manual for VW model years 2012 and ... The Volkswagen Online Owner's Manual. We've made it easy to access your ... Strategic Leadership: The Essential Skills Strategic leaders must be adept at finding common ground and achieving buy-in among stakeholders who have disparate views and agendas. This requires active ... Top 6 Leadership Skills for Strategic Management | CMOE What Makes a Good Manager? · 1. Learn To Delegate · 2. Care about Communication · 3. Exude Confidence · 4. Customize Your Approach · 5. Strategic Thinking and ... Strategic Management: Definition, Purpose and Example Mar 10, 2023 — Five steps of strategic management · 1. Identification · 2. Analysis · 3. Formation · 4. Execution · 5. Evaluation. What is strategic thinking? How do management see this ... May 14, 2017 — Key fundamentals include a deep understanding of your objectives, a clear vision of where you want to go, the ability to assess your current ... Strategic Management Skills - ReadyToManage Mar 8, 2013 — Strategic Management Skills · Big picture thinking · Listening skills · Commercial acumen · Planning and Organizing · Collaboration ability. What are the strategic skills ? Feb 21, 2023 — These skills involve the ability to think critically, analyze data, and make decisions based on a clear understanding of the business landscape, ... 6 Skills of Strategic Planning Skills Required and Utilized in Strategic Planning · Development and Marketing Skills · Research, Analytical and Critical Thinking Skills · Information Systems ... 6 Skills You Need to Become A Strategic Leader | TSI Jun 7, 2021 — 1. The Conversation Guide - Building space for deeper and focused conversations · 2. The Questioner - Framing appreciative questions · 3. The ... 4 Ways to Develop Your Strategic Thinking Skills | HBS Online Sep

10, 2020 — Strategic thinking skills are any skills that enable you to use critical thinking to solve complex problems and plan for the future. These ...