

Neural Algorithm for Solving Differential Equations

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Finite difference equations are considered to solve differential equations numerically by utilizing minimization algorithms. Neural minimization algorithms for solving the finite difference equations are presented. Results of numerical simulation are described to demonstrate the method. Methods of implementing the algorithms are discussed. General features of the neural algorithms are discussed. © 1990 Academic Press, Inc.

I. INTRODUCTION

Numerical computation in many disciplines, such as physics, applied mathematics, electrical engineering, biochemistry, etc., has received a great deal of attention recently as a practical technique to understand complex phenomena that are almost impossible to treat analytically [1]. Supercomputers have been built to speed up the calculation. Furthermore, new computing algorithms based on the concept of concurrent processing have been developed and implemented by connecting a small number of processors.

Recently, highly parallel neural networks have been investigated extensively to solve complicated problems such as pattern recognition and combinatorial optimization [2]. Linear simultaneous equations also have been treated by applying neural networks [3]. Implementation of neural networks by utilizing volume holographic optical interconnections have proved to be promising [4].

One of the most general methods of solving differential equations is to use finite difference equations and to solve the algebraic equations [5]. The computational load for solving the difference equations increases very fast as the number of discrete points becomes large. Therefore, a highly parallel algorithm to solve the finite difference equations is essential when a complicated problem is encountered. In this paper, neural algorithms for minimization are utilized to develop highly parallel

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Table of Contents Neural Algorithm For Solving Differential Equations

1. Understanding the eBook Neural Algorithm For Solving Differential Equations
 - The Rise of Digital Reading Neural Algorithm For Solving Differential Equations
 - Advantages of eBooks Over Traditional Books
2. Identifying Neural Algorithm For Solving Differential Equations
 - 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 Neural Algorithm For Solving Differential Equations
 - User-Friendly Interface
4. Exploring eBook Recommendations from Neural Algorithm For Solving Differential Equations
 - Personalized Recommendations
 - Neural Algorithm For Solving Differential Equations User Reviews and Ratings
 - Neural Algorithm For Solving Differential Equations and Bestseller Lists
5. Accessing Neural Algorithm For Solving Differential Equations Free and Paid eBooks
 - Neural Algorithm For Solving Differential Equations Public Domain eBooks
 - Neural Algorithm For Solving Differential Equations eBook Subscription Services
 - Neural Algorithm For Solving Differential Equations Budget-Friendly Options
6. Navigating Neural Algorithm For Solving Differential Equations eBook Formats
 - ePub, PDF, MOBI, and More
 - Neural Algorithm For Solving Differential Equations Compatibility with Devices
 - Neural Algorithm For Solving Differential Equations Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Neural Algorithm For Solving Differential Equations
 - Highlighting and Note-Taking Neural Algorithm For Solving Differential Equations
 - Interactive Elements Neural Algorithm For Solving Differential Equations
8. Staying Engaged with Neural Algorithm For Solving Differential Equations

- Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Neural Algorithm For Solving Differential Equations
9. Balancing eBooks and Physical Books Neural Algorithm For Solving Differential Equations
- Benefits of a Digital Library
 - Creating a Diverse Reading Collection Neural Algorithm For Solving Differential Equations
10. Overcoming Reading Challenges
- Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Neural Algorithm For Solving Differential Equations
- Setting Reading Goals Neural Algorithm For Solving Differential Equations
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Neural Algorithm For Solving Differential Equations
- Fact-Checking eBook Content of Neural Algorithm For Solving Differential Equations
 - 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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[17](#)

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