NEURAL NETWORK WEIGHT OPTIMIZATION ALGORITHM PATENT

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ABSTRACT

A system and method for optimizing neural network weights in industrial control system security applications, comprising an adaptive learning algorithm that dynamically adjusts network parameters based on operational technology (OT) traffic patterns and threat signatures. The invention provides enhanced accuracy in anomaly detection while reducing false positives through multi-layer weight optimization across interconnected neural network nodes.

BACKGROUND OF INVENTION

[0001] Industrial control systems (ICS) face increasingly sophisticated cyber threats requiring advanced detection mechanisms. Traditional neural networks often struggle with the complex, non-linear nature of OT network traffic patterns, leading to suboptimal threat detection accuracy.

[0002] Existing weight optimization approaches typically rely on static training datasets, limiting their effectiveness in dynamic industrial environments where threat patterns evolve rapidly.

SUMMARY OF INVENTION

[0003] The present invention relates to a novel method for optimizing neural network weights specifically designed for industrial cybersecurity applications. The system implements a three-layer optimization protocol that:

a) Continuously analyzes real-time OT network traffic patterns

b) Identifies behavioral anomalies through comparative analysis

c) Dynamically adjusts neural network weights using proprietary algorithms

d) Maintains optimization history for progressive learning

DETAILED DESCRIPTION

Weight Optimization Protocol

[0004] The system comprises:

Primary Analysis Layer

- Real-time traffic pattern monitoring
- Baseline behavior establishment
- Deviation threshold calculation

Optimization Engine

- Proprietary gradient descent algorithm
- Multi-node weight adjustment protocol
- Cross-validation mechanism

Implementation Layer

- Dynamic weight updates
- Performance metric tracking
- Feedback loop integration

Mathematical Framework

[0005] The core optimization function is defined as:

```
W(t+1) = W(t) -  E(W)
```

Where:

W = Weight matrix

t = Time step

= Learning rate

E = Error function

Implementation Architecture

[0006] The system architecture includes:

Input Processing Module

Pattern Recognition Engine

Weight Calculation Unit

Optimization Controller

Output Validation System

CLAIMS

A method for optimizing neural network weights comprising:

a) Receiving real-time OT network traffic data

b) Analyzing traffic patterns using proprietary algorithms

c) Calculating optimal weight adjustments

d) Implementing weight updates across network nodes

The method of claim 1, wherein the optimization process includes:

a) Continuous monitoring of system performance

b) Adaptive learning rate adjustment

c) Multi-layer validation protocols

A system for implementing the method of claim 1, comprising:

a) Processing units for real-time data analysis

b) Storage modules for pattern history

c) Optimization engines for weight calculation

d) Implementation controllers for updates

DRAWINGS

[0007] Figure 1: System Architecture Diagram

[0008] Figure 2: Optimization Flow Chart

[0009] Figure 3: Implementation Schema

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ASSIGNMENT

All rights, title, and interest in this patent are assigned to DeepShield Systems, Inc., a Delaware corporation, its successors, and assigns.

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CERTIFICATION

I hereby certify that this patent document and all statements made herein of my own knowledge are true, and that statements made on information and belief are believed to be true.

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