IoT Sensor Data Processing Algorithm Patent

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Assignee: Summit Digital Solutions, Inc.

ABSTRACT

A system and method for processing data from distributed Internet of Things (IoT) sensors using an adaptive machine learning algorithm that optimizes sensor data collection, filtering, and analysis in real-time enterprise environments. The invention comprises a novel approach to sensor data normalization, automated anomaly detection, and predictive maintenance forecasting through distributed edge computing architecture.

BACKGROUND OF THE INVENTION

[001] Modern enterprise environments increasingly rely on networks of IoT sensors to monitor and optimize operations. However, existing solutions face challenges in efficiently processing large volumes of heterogeneous sensor data while maintaining real-time performance requirements.

[002] Current approaches typically utilize centralized processing architectures that create bottlenecks and latency issues when scaling to enterprise-level deployments. Additionally, existing solutions lack sophisticated methods for automated sensor calibration and data quality validation.

SUMMARY OF THE INVENTION

[003] The present invention provides a distributed processing architecture for IoT sensor networks that implements novel algorithms for real-time data analysis and predictive modeling. Key components include:

a) An adaptive edge computing framework that automatically optimizes processing distribution between local and cloud resources
b) Machine learning models that continuously improve sensor calibration accuracy
c) Automated anomaly detection using comparative analysis across sensor clusters
d) Predictive maintenance forecasting based on historical failure pattern analysis

DETAILED DESCRIPTION

1. System Architecture

[004] The system comprises:

1 A network of distributed IoT sensors equipped with edge processing capabilities

2 Local aggregation nodes for preliminary data processing and filtering

3 Cloud-based master nodes for advanced analytics and model training

4 Secure communication protocols for data transmission between system components

2. Data Processing Algorithm

[005] The core algorithm implements the following sequence:

1 Raw sensor data collection and initial validation

2 Edge-based filtering and normalization

3 Anomaly detection using statistical analysis

4 Pattern recognition through machine learning models

5 Predictive analytics generation

3. Machine Learning Implementation

[006] The system utilizes:

1 Supervised learning for pattern recognition

2 Unsupervised clustering for anomaly detection

3 Reinforcement learning for optimization of processing distribution

4 Neural networks for predictive maintenance modeling

CLAIMS

A method for processing IoT sensor data comprising:

a) Collecting raw data from distributed sensors

b) Performing edge-based preprocessing and filtering

c) Implementing machine learning-based analysis

d) Generating predictive maintenance forecasts

The method of claim 1, wherein edge-based preprocessing includes:

a) Data normalization

b) Quality validation

c) Initial anomaly detection

d) Local pattern recognition

A system for implementing the method of claims 1-2, comprising:

a) Distributed IoT sensors with edge processing capabilities

b) Local aggregation nodes

c) Cloud-based master nodes

d) Secure communication infrastructure

DRAWINGS

[007] Figure 1: System Architecture Diagram

[008] Figure 2: Data Flow Schematic

[009] Figure 3: Algorithm Processing Sequence

[010] Figure 4: Machine Learning Model Architecture

INVENTOR INFORMATION

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ASSIGNMENT

All rights, title, and interest in this patent application are assigned to Summit Digital Solutions, Inc., a Delaware corporation with its principal place of business at 444 Technology Drive, Suite 800, San Jose, CA 95110.

CERTIFICATION

I hereby certify that I am authorized to execute this patent application on behalf of Summit Digital Solutions, Inc. and that all statements made herein are true and correct to the best of my knowledge.

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Date: March 15, 2023

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