REAL-TIME DATA PROCESSING PATENT

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ABSTRACT

A system and method for real-time processing of industrial sensor data utilizing machine learning algorithms for predictive analytics and operational optimization. The invention comprises a distributed network of IoT sensors, edge computing devices, and a central processing platform that enables real-time analysis of manufacturing and operational data streams. The system implements proprietary algorithms for pattern recognition, anomaly detection, and automated decision-making in industrial environments.

BACKGROUND OF INVENTION

[0001] Modern industrial operations generate vast quantities of real-time data from multiple sensor sources, creating challenges in data processing, analysis, and actionable insight generation. Existing solutions often fail to provide real-time processing capabilities while maintaining accuracy and scalability across enterprise environments.

[0002] Traditional batch processing methods introduce significant latency between data collection and analysis, limiting the ability to implement immediate corrective actions or optimize operations in real-time. This invention addresses these limitations through a novel approach to distributed processing and machine learning implementation.

SUMMARY OF INVENTION

[0003] The present invention provides a system and method for real-time processing of industrial sensor data comprising:

(a) A distributed network of IoT sensors configured to collect operational data;

(b) Edge computing devices implementing preliminary data processing and filtering;

(c) A central processing platform utilizing machine learning algorithms for advanced analytics;

(d) Real-time visualization and alerting capabilities; and

(e) Automated response mechanisms for operational optimization.

DETAILED DESCRIPTION

Data Collection Subsystem

[0004] The invention implements a scalable sensor network architecture supporting multiple industrial protocols including Modbus, OPC-UA, and proprietary interfaces. Sensors are configured to collect:

- Temperature and pressure readings
- Vibration analysis data
- Power consumption metrics
- Production line timing data
- Quality control measurements
- Environmental conditions

Edge Processing Layer

[0005] Edge devices implement preliminary processing including:

- Data validation and cleaning
- Initial anomaly detection
- Local caching capabilities
- Protocol translation
- Bandwidth optimization
- Preliminary analytics

Central Processing Platform

[0006] The central platform implements advanced processing capabilities including:

- Real-time stream processing
- Machine learning model execution
- Pattern recognition algorithms
- Predictive maintenance calculations
- Performance optimization analytics

- Multi-variable correlation analysis

Machine Learning Implementation

[0007] The system utilizes proprietary machine learning algorithms including:

- Supervised learning for pattern recognition
- Unsupervised learning for anomaly detection
- Reinforcement learning for optimization
- Deep learning for complex pattern analysis
- Transfer learning for model adaptation
- Ensemble methods for improved accuracy

CLAIMS

A method for real-time processing of industrial sensor data comprising:

a) Collecting operational data from distributed IoT sensors;

b) Performing edge processing of collected data;

c) Transmitting processed data to a central platform;

d) Executing machine learning algorithms for analysis;

e) Generating automated responses based on analysis results.

The method of claim 1, wherein edge processing includes data validation, preliminary analytics, and local caching capabilities.

The method of claim 1, wherein machine learning algorithms include supervised learning, unsupervised learning, and reinforcement learning techniques.

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ASSIGNMENT RECORD

All rights, title, and interest in this patent have been assigned to Summit Digital Solutions, Inc., a Delaware corporation, as recorded in the United States Patent and Trademark Office at Reel/Frame 045123/0789.

MAINTENANCE FEES

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FOREIGN FILING RIGHTS

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CERTIFICATION

I hereby certify that this patent document accurately reflects the invention as assigned to Summit Digital Solutions, Inc. and contains no known material misrepresentations.

/s/ James Wilson

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