# PATENT APPLICATION

## Real-time Analytics Engine for Enterprise Process Optimization

USPTO Application No. [DRAFT]

### BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to systems and methods for real-time analytics processing in enterprise environments, and more particularly to a distributed computing architecture for collecting, analyzing, and optimizing operational data streams using machine learning algorithms.

[0002] Traditional enterprise analytics systems suffer from significant latency between data collection and actionable insights, limiting their utility for real-time process optimization. Existing solutions typically require batch processing of historical data, creating delays that reduce operational efficiency and prevent dynamic system adaptation.

### SUMMARY OF THE INVENTION

[0003] The present invention provides systems and methods for real-time enterprise analytics processing through a novel distributed architecture combining edge computing, machine learning, and adaptive optimization algorithms. The system enables sub-second analysis of operational data streams while maintaining scalability across enterprise deployments.

[0004] In one aspect, the invention comprises a distributed network of sensor nodes implementing local preprocessing algorithms to reduce data transmission overhead while preserving critical operational insights. The preprocessed data streams are aggregated through regional processing nodes utilizing parallel computing architectures to enable real-time analysis.

### DETAILED DESCRIPTION

[0005] The present invention will be described with reference to the accompanying drawings, wherein:

[0006] FIG. 1 illustrates the overall system architecture including sensor nodes, regional processors, and the central analytics engine.

[0007] FIG. 2 shows the data flow between system components including preprocessing, aggregation, and optimization stages.

**System Architecture**

[0008] The system comprises three primary architectural layers:

Edge Layer - Distributed sensor nodes implementing local preprocessing algorithms

Regional Layer - Aggregation nodes performing parallel stream processing

Core Layer - Central analytics engine executing machine learning models

[0009] The Edge Layer utilizes proprietary compression algorithms to reduce bandwidth requirements while maintaining data fidelity. Each sensor node implements:

- Local data buffering
- Signal preprocessing
- Anomaly detection
- Adaptive sampling

[0010] The Regional Layer aggregates preprocessed data streams using:

- Load-balanced stream processing
- Dynamic resource allocation
- Distributed caching
- Real-time feature extraction

**Analytics Processing**

[0011] The Core Layer implements novel machine learning algorithms including:

- Online model training
- Incremental learning
- Multi-objective optimization
- Automated hyperparameter tuning

[0012] The system achieves sub-second processing through:

Parallel execution of analytics workflows

GPU acceleration of machine learning models

In-memory processing of critical data streams

Adaptive resource allocation

**CLAIMS**

What is claimed is:

A system for real-time enterprise analytics processing, comprising:

- A distributed network of sensor nodes
- Regional processing nodes implementing parallel computing
- A central analytics engine executing machine learning models
- Methods for sub-second optimization of operational parameters

The system of claim 1, wherein the sensor nodes implement local preprocessing algorithms including:

- Data compression
- Signal filtering
- Anomaly detection
- Adaptive sampling

The system of claim 1, wherein the regional processing nodes perform:

- Stream aggregation
- Feature extraction
- Distributed caching
- Load balancing

**ABSTRACT**

A system and method for real-time analytics processing in enterprise environments is disclosed. The invention comprises a distributed architecture combining edge computing, stream processing, and machine learning to enable sub-second optimization of operational parameters. Novel algorithms for data preprocessing, parallel analysis, and automated optimization are implemented across multiple processing layers. The system achieves significant improvements in processing latency while maintaining scalability for enterprise deployments.

**INVENTOR(S)**

- Michael Chang, Chief Technology Officer
- Dr. Robert Martinez, Chief Innovation Officer

Summit Digital Solutions, Inc.

1234 Innovation Drive

Wilmington, DE 19801

**ATTORNEY DOCKET**

SDS-PAT-2024-001

Prepared by:

Johnson & Williams LLP

Patent Attorneys

100 State Street, Suite 400

Boston, MA 02109

[Additional technical drawings and specifications to follow]