DATA PIPELINE ARCHITECTURE PATENT APPLICATION

United States Patent Application

Application No.: 17/482,391

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TITLE OF INVENTION

System and Method for Intelligent Data Pipeline Architecture with Dynamic Resource Allocation

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 63/279,845, filed March 15, 2023.

BACKGROUND

Field of Invention

[0002] The present invention relates to computer-implemented systems and methods for enterprise data processing, specifically to an intelligent data pipeline architecture that dynamically allocates computing resources based on real-time workflow demands and machine learning optimization.

Prior Art

[0003] Traditional data pipeline architectures typically employ static resource allocation and fixed processing paths, leading to inefficient resource utilization and processing bottlenecks. While existing solutions attempt to address these limitations through manual intervention or predetermined rules, they fail to provide truly adaptive resource management capabilities.

SUMMARY OF INVENTION

[0004] The present invention provides a novel system and method for implementing an intelligent data pipeline architecture that automatically optimizes resource allocation and processing paths using machine learning algorithms. The system comprises:

a) A dynamic resource allocation engine that monitors pipeline performance metrics in real-time;

b) An artificial intelligence module that predicts processing requirements based on historical patterns;

c) A self-optimizing workflow manager that automatically adjusts pipeline configurations;

d) An intelligent load balancing system that distributes processing tasks across available resources.

DETAILED DESCRIPTION

System Architecture

[0005] The system includes the following primary components:

Resource Monitoring Module

- Continuous monitoring of CPU, memory, and network utilization
- Real-time performance metric collection
- Resource availability tracking
- Bottleneck detection algorithms

Machine Learning Engine

- Predictive analytics for resource requirements
- Pattern recognition for workflow optimization
- Anomaly detection capabilities
- Self-learning performance models

Dynamic Configuration Manager

- Automated pipeline reconfiguration
- Resource allocation optimization
- Workflow path adjustment
- Performance threshold management

Method Implementation

[0006] The method comprises the following steps:

Initial pipeline configuration and baseline establishment

Continuous monitoring of system performance metrics

Machine learning-based analysis of historical performance data

Dynamic resource allocation based on predictive models

Automated workflow optimization and reconfiguration

Performance validation and feedback loop implementation

CLAIMS

A computer-implemented method for dynamic data pipeline management, comprising:

a) monitoring real-time performance metrics of data processing pipelines;

b) analyzing historical performance patterns using machine learning algorithms;

c) automatically adjusting resource allocation based on predictive models;

d) optimizing workflow configurations in response to changing demands.

The method of claim 1, wherein the machine learning algorithms comprise:

a) neural networks for pattern recognition;

b) decision trees for resource allocation;

c) reinforcement learning for optimization;

d) anomaly detection for system monitoring.

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

a) at least one processor;

b) memory storing instructions;

c) network interfaces;

d) monitoring modules;

e) machine learning engines.

ABSTRACT

A system and method for intelligent data pipeline architecture that dynamically allocates computing resources based on real-time workflow demands and machine learning optimization. The invention includes monitoring modules, predictive analytics engines, and automated configuration management systems that work together to optimize data processing efficiency and resource utilization.

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POWER OF ATTORNEY

The undersigned hereby appoints Blackwell & Associates, Registration No. 58,291, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Executed on: September 15, 2023

/s/ Dr. Alexandra Reeves

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