MACHINE LEARNING MODEL TRAINING METHOD PATENT

Patent No. SDS-ML-2023-157

Filing Date: March 15, 2023

Assignee: Summit Digital Solutions, Inc.

ABSTRACT

A method and system for training machine learning models using distributed computing resources and automated hyperparameter optimization. The invention relates to an efficient process for parallel model training across multiple computing nodes while dynamically adjusting training parameters based on real-time performance metrics.

BACKGROUND OF INVENTION

[0001] Machine learning model training traditionally requires significant computational resources and manual parameter tuning. Existing methods often fail to efficiently utilize distributed computing resources and lack automated optimization capabilities.

[0002] The present invention addresses these limitations through a novel approach to distributed model training with intelligent resource allocation and automated parameter adjustment.

SUMMARY OF INVENTION

[0003] The invention provides a method for training machine learning models comprising:

- Distributed computing architecture for parallel model training
- Automated hyperparameter optimization using reinforcement learning
- Dynamic resource allocation based on model performance metrics
- Real-time training progress monitoring and adjustment

DETAILED DESCRIPTION

1. System Architecture

[0004] The system comprises:

1 A central orchestration server managing distributed training nodes

2 Multiple worker nodes executing parallel training processes

3 A parameter optimization engine utilizing reinforcement learning

4 Real-time monitoring and metrics collection subsystem

2. Training Process

[0005] The training method includes:

1 Initial model configuration and parameter space definition

2 Automated distribution of training tasks across worker nodes

3 Continuous performance monitoring and metric collection

4 Dynamic adjustment of hyperparameters based on performance feedback

3. Optimization Algorithm

[0006] The optimization process comprises:

1 Reinforcement learning agent for parameter selection

2 Reward function based on model performance metrics

3 Exploration-exploitation balance mechanism

4 Convergence criteria and stopping conditions

CLAIMS

A method for training machine learning models, comprising:

a) Distributing training tasks across multiple computing nodes

b) Automatically optimizing hyperparameters using reinforcement learning

c) Dynamically allocating computing resources based on performance metrics

The method of claim 1, wherein the reinforcement learning agent:

a) Selects hyperparameters from a defined parameter space

b) Receives feedback based on model performance

c) Updates parameter selection strategy based on received feedback

The method of claim 1, further comprising:

a) Real-time monitoring of training progress

b) Automatic adjustment of resource allocation

c) Performance metric collection and analysis

DRAWINGS

[0007] Figure 1: System architecture diagram

[0008] Figure 2: Training process flowchart

[0009] Figure 3: Optimization algorithm schematic

INVENTORS

- Dr. Robert Martinez, Chief Innovation Officer
- Michael Chang, Chief Technology Officer
- Dr. Sarah Chen, Principal Machine Learning Engineer

PATENT ATTORNEY

James Wilson (Reg. No. 45,789)

Wilson & Associates, LLP

100 Technology Square

Boston, MA 02142

ASSIGNMENT

The inventors hereby assign all right, title, and interest in this patent application to Summit Digital Solutions, Inc., a Delaware corporation having its principal place of business at 2500 Innovation Drive, Boston, MA 02210.

DECLARATION

I hereby declare that:

I am the original inventor of the subject matter described

I have reviewed and understand the contents of this application

I acknowledge the duty to disclose information material to patentability

EXECUTION

IN WITNESS WHEREOF, the undersigned has executed this patent application as of the date first written above.

_

Dr. Robert Martinez

Chief Innovation Officer

Summit Digital Solutions, Inc.

_

Michael Chang

Chief Technology Officer

Summit Digital Solutions, Inc.

_

Dr. Sarah Chen

Principal Machine Learning Engineer

Summit Digital Solutions, Inc.