# ML MODEL VERSION CONTROL SYSTEM PATENT

**United States Patent Application No. 16/789,432**

**Filing Date: March 15, 2023**

**Assignee: Summit Digital Solutions, Inc.**

## ABSTRACT

A system and method for version control of machine learning models, comprising a distributed repository architecture for tracking model iterations, training datasets, and deployment configurations. The system includes mechanisms for automated model lineage tracking, performance metric comparison, and rollback capabilities across distributed enterprise environments.

## BACKGROUND

[0001] Machine learning model development requires rigorous version control to track iterations, compare performance, and maintain deployment consistency. Existing version control systems are inadequate for managing the unique aspects of ML model development, including training data dependencies, hyperparameter configurations, and deployment environments.

[0002] Current solutions fail to address the complexities of enterprise-scale ML operations, particularly regarding model governance, audit trails, and compliance requirements in regulated industries.

## DETAILED DESCRIPTION

### I. System Architecture

[0003] The present invention provides a distributed version control system specifically designed for machine learning models, comprising:

(a) A central repository manager that maintains:

- Model artifacts and binary files
- Training dataset checksums and metadata
- Hyperparameter configurations
- Performance metrics and validation results
- Deployment environment specifications

(b) A distributed node architecture enabling:

- Local development environments
- Automated synchronization protocols
- Conflict resolution mechanisms
- Parallel training capabilities

**II. Version Control Implementation**

[0004] The system implements version control through:

(a) Unique identifiers for each model version using:

- SHA-256 hashing of model parameters
- Timestamp-based versioning
- Hierarchical naming conventions

(b) Metadata tracking including:

- Training dataset versions
- Hardware configurations
- Environmental variables
- Dependencies and libraries

**III. Performance Tracking**

[0005] The system maintains comprehensive performance metrics:

(a) Automated logging of:

- Training accuracy and loss
- Validation metrics
- Inference speed
- Resource utilization

(b) Comparative analysis tools for:

- Cross-version performance evaluation
- A/B testing results
- Production deployment metrics

## CLAIMS

A method for version control of machine learning models, comprising:

(a) Generating unique identifiers for model versions

(b) Tracking training dataset dependencies

(c) Managing deployment configurations

(d) Maintaining performance metrics

(e) Enabling rollback capabilities

The method of claim 1, wherein generating unique identifiers comprises:

(a) Computing cryptographic hashes of model parameters

(b) Incorporating timestamp information

(c) Applying hierarchical naming conventions

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

(a) A central repository manager

(b) Distributed development nodes

(c) Synchronization protocols

(d) Conflict resolution mechanisms

## DRAWINGS

[0006] Figure 1: System Architecture Diagram

[0007] Figure 2: Version Control Flow

[0008] Figure 3: Performance Tracking Interface

## INVENTOR INFORMATION

Inventors:

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

Summit Digital Solutions, Inc.

1234 Innovation Drive

Wilmington, DE 19801

## PATENT ATTORNEY INFORMATION

Sarah Johnson, Esq.

Registration No. 65432

Technology Patents LLP

100 Legal Plaza

Boston, MA 02110

## ASSIGNMENT

All rights, title, and interest in this patent application are assigned to Summit Digital Solutions, Inc., a Delaware corporation, including all rights to file continuing applications, foreign applications, and to claim priority therefrom.

## DECLARATION

I hereby declare that I am the original inventor of the subject matter which is claimed and for which a patent is sought; that I have reviewed and understand the contents of the above-identified specification; and that all statements made herein of my own knowledge are true and correct.

Executed on: March 15, 2023

_

Dr. Michael Chang

_

Dr. Robert Martinez

_

James Henderson