

PATENT APPLICATION

ML MODEL OPTIMIZATION SYSTEM AND METHOD

USPTO Application No. [DRAFT]

FIELD OF THE INVENTION

[0001] The present invention relates generally to machine learning systems, and more particularly to methods and systems for optimizing machine learning model performance in enterprise environments through dynamic hyperparameter tuning and automated feature engineering.

BACKGROUND

[0002] Machine learning models deployed in enterprise environments often suffer from degraded performance over time due to data drift, concept drift, and sub-optimal hyperparameter configurations. Existing solutions for model optimization typically require manual intervention and cannot automatically adapt to changing data distributions or business conditions.

[0003] There remains a need for systems and methods that can automatically optimize machine learning models in production environments while maintaining model accuracy and computational efficiency.

SUMMARY OF THE INVENTION

[0004] The present invention provides systems and methods for automated optimization of machine learning models through continuous monitoring and dynamic adjustment of model parameters, feature engineering processes, and training procedures.

[0005] In one aspect, the invention comprises a system for machine learning model optimization, including:

- A model monitoring component that tracks key performance indicators
- A feature engineering pipeline that automatically generates and selects optimal features
- A hyperparameter optimization engine that dynamically tunes model parameters
- A distributed computing framework that enables parallel optimization processes
- An automated retraining scheduler that maintains model accuracy

DETAILED DESCRIPTION

[0006] The present invention will be described with reference to the accompanying drawings and flowcharts.

Model Monitoring Component

[0007] The model monitoring component continuously tracks:

- Prediction accuracy metrics
- Data distribution statistics
- Resource utilization metrics
- Model latency measurements
- Feature importance scores

[0008] When performance degradation is detected, the system automatically initiates optimization procedures.

Feature Engineering Pipeline

[0009] The automated feature engineering pipeline implements:

- Statistical feature generation
- Temporal feature extraction
- Interaction feature creation
- Feature selection using mutual information scoring
- Dimension reduction techniques

Hyperparameter Optimization Engine

[0010] The optimization engine employs:

- Bayesian optimization algorithms
- Multi-armed bandit approaches
- Genetic algorithms for parameter search
- Cross-validation procedures
- Resource-aware optimization constraints

CLAIMS

A system for machine learning model optimization comprising:

- a) a model monitoring component;
- b) a feature engineering pipeline;
- c) a hyperparameter optimization engine;
- d) a distributed computing framework; and
- e) an automated retraining scheduler.

The system of claim 1, wherein the model monitoring component continuously tracks performance metrics and initiates optimization procedures upon detecting degradation.

The system of claim 1, wherein the feature engineering pipeline automatically generates and selects optimal features using statistical and temporal analysis.

[Claims 4-20 continue...]

ABSTRACT

A system and method for automated optimization of machine learning models in production environments. The invention provides continuous monitoring of model performance metrics and automated adjustment of model parameters, feature engineering processes, and training procedures. The system includes components for model monitoring, feature engineering, hyperparameter optimization, distributed computing, and automated retraining scheduling.

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POWER OF ATTORNEY

The undersigned hereby appoints Patent Law Group LLP, Registration No. 12345, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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DECLARATION

I hereby declare that I believe 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.

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