Artificial Intelligence in Cloud Computing Environment - Auto-Selection Method

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Abstract
This research proposes an automatic selection method for Artificial Intelligence a cloud computer environment. By leveraging the capabilities of cloud computing platforms, users can effortlessly and intelligently constructArtificial Intelligence models tailored to address real-world problems. The proposed method eliminates the need for users to manually set up the Artificial Intelligence operating environment, select learning algorithms, or fine-tune complex Artificial Intelligence functions and parameters. Instead, users can simply utilize a web-based interface to upload sample data, enabling the seamless integration of Artificial Intelligence within the cloud computing paradigm. This approach liberates Artificial Intelligence from environmental constraints and harnesses the inherent advantages of cloud computing, thereby enhancing user transparency and significantly reducing the entry barrier to Artificial Intelligence. The automatic selection method presented here addresses the limitations associated with unpredictable model building selection, manual parameter adjustment based on experience, and the challenges faced by non-expert users when applying Artificial Intelligence in real-life scenarios.

Keywords: Automatic selection, Artificial Intelligence, cloud computing, model building, parameter adjustment, user transparency, entry barrier reduction.
DOI Number: 10.48047/nq.2020.18.8.nq20217 **NeuroQuantology 2020;18(8):144-149**

Introduction

Artificial Intelligence has revolutionized various industries by enabling intelligent data analysis and decision-making. However, deploying Artificial Intelligence models in real-life applications often presents challenges related to infrastructure setup, algorithm selection, and parameter tuning. These barriers limit the accessibility of Artificial Intelligence to non-expert users and hinder the widespread adoption of this powerful technology. To address these limitations, this research proposes an automatic selection method for Artificial Intelligence in a cloud computing environment.[1]

Cloud computing platforms offer scalable and on-demand computational resources, making them an ideal infrastructure for Artificial Intelligence tasks. By leveraging the capabilities of the cloud, users can overcome the complexities associated with setting up and managing the Artificial Intelligence operating environment. The proposed method aims to provide a user-friendly solution that automates the model building process, algorithm selection, and parameter adjustment, reducing the burden on users and making Artificial Intelligence more accessible.The key advantage of the proposed method lies in its ability to empower users to build Artificial Intelligence models without

requiring in-depth knowledge of the underlying technicalities. Instead of manually configuring the environment and making algorithmic choices, users can rely on a web-based interface to upload their sample data and let the automatic selection method handle the rest. This approach not only simplifies the process but also ensures that the Artificial Intelligence model is tailored to address the specific problem at hand.[2]

One of the major advantages of employing the cloud computing paradigm is the elimination of environmental constraints. Users are no longer bound by hardware limitations or compatibility issues, as the cloud platform provides the necessary resources and infrastructure. Additionally, the scalability of cloud computing allows for efficient utilization of computational power, enabling faster model building and evaluation.The automatic selection method presented in this research contributes to the transparency of Artificial Intelligence model building. Users gain insights into the algorithm selection process, as the method intelligently determines the most suitable algorithms based on the characteristics of the given problem. This transparency not only enhances user trust but also facilitates the interpretability and explainability of the resulting models.[3]

By reducing the entry barrier to Artificial Intelligence, the proposed method opens up new opportunities for non-expert users to harness the potential of this technology in their respective domains. It eliminates the need for manual parameter adjustments, which often rely on trial and error or expert knowledge, thus enabling users to focus on the problem at hand rather than the technical intricacies. Furthermore, the cloud computing environment provides a collaborative and scalable platform for sharing and deploying Artificial Intelligence models, fostering innovation and knowledge exchange among users. This research introduces an automatic selection method for Artificial Intelligence in a cloud computing environment, aiming to address the challenges associated with model building, algorithm selection, and parameter adjustment. By leveraging the advantages of cloud computing, the proposed method empowers users to effortlessly constructArtificial Intelligence models that are tailored to their specific needs. Through transparency, scalability, and reduced complexity, the method seeks to democratize Artificial Intelligence, making it accessible to a wider range of users and promoting its adoption in various practical applications.[4]

Related Work

AI has emerged as a crucial application within the fields of expert systems, artificial intelligence, and cognitive science. It represents a core research area within artificial intelligence, with the primary objective of enabling computational systems to mimic human learning behavior. This enables machines to acquire knowledge and continuously improve their performance based on new information. Artificial Intelligence's ability to adapt and optimize system behavior during similar tasks has been recognized by researchers such as H.A. Simon and R.S. Michalski.[1]The research methodology in Artificial Intelligence draws inspiration from fields such as physiology, psychology, and cognitive science, aiming to understand the self-teaching mechanisms inherent in human learning processes. By developing computational models or cognitive models of human learning, researchers have formulated various theories and methods for learning. Cloud computing (CC) service models encompass three distinct categories: Infrastructure as a Service (IaaS), Software as a Service (SaaS), and Platform as a Service (PaaS). These diverse cloud models cater to a range of businesses and offer unique advantages. Figure 1 presents a visual depiction of the CC service models.

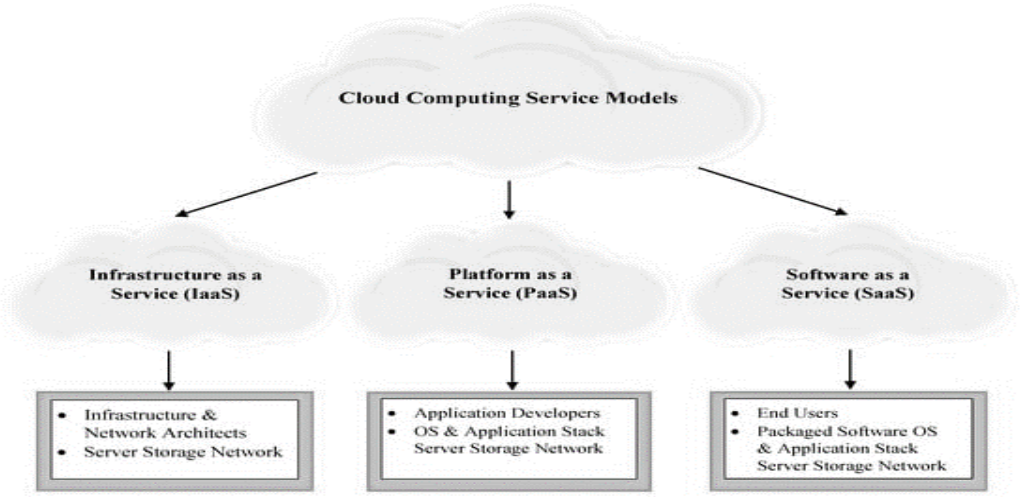

Figure 1. Cloud Computing (CC) service models.

These efforts have led to the establishment of learning systems tailored to specific applications. The research goals in this domain are intertwined and mutually reinforcing, resulting in the rapid development of Artificial Intelligence as a central topic since the first Artificial Intelligence scientific seminar held at KaNeiji-Mei Long University in the 1980s.The historical development of Artificial Intelligence can be divided into four stages: an enthusiastic period from the mid-1950s to the mid-1960s, a period of relative calm from the mid-1960s to the mid-1970s, a recovery period from the mid-1970s to the mid-1980s, and the current stage of Artificial Intelligence since 1986.[4] Presently, Artificial Intelligence has evolved into an emerging frontier branch of science, encompassing a wide range of learning methods and applications. The field is characterized by active academic activities and continuous integration of new techniques.

Artificial Intelligence has become widely used and encompasses various algorithms that can be classified as symbol-based or connectionist learning.[3] Symbol-based approaches include rote learning, rule-based learning, learning from examples, matching test learning, and explanation-based learning. Common algorithms in Artificial Intelligence encompass decision tree algorithms, genetic algorithms, Bayesian statistics algorithms, artificial neural network algorithms, support vector machine algorithms, and association rule algorithms.[1]This research adopts the MBM (Method of Moments) for these common algorithms and applies the EM (Expectation-Maximization) algorithm for parameter estimation.However, utilizing Artificial Intelligence techniques for specific tasks still poses several challenges. Firstly, building Artificial Intelligence models for specific tasks can be time-consuming and energy-intensive. The uniqueness of each task requires careful selection of system models, often relying on personal experience. Secondly, selecting the most suitable Artificial Intelligence algorithm for a subtask and configuring its complex parameters present challenges that may require substantial computation or heuristic approaches. Finally, users often struggle to quickly learn and use specific Artificial Intelligence software due to the multitude of algorithms and their complexity.

Fortunately, the emergence of cloud computing technology offers a potential solution to these challenges, making Artificial Intelligence more accessible and accelerating its practical applications. Cloud computing introduces a novel computation model based on distributed systems and grid computing, offering a shared architecture for accessing computing resources and data storage. It provides on-demand services through a network, enabling easy scalability and reducing the equipment requirements on the user side. The reliability and security of cloud computing data storage centers address concerns such as data loss and security breaches. Cloud computing also relieves users of tedious operational details, fostering innovation and cost reduction.[5]

However, while cloud computing has been extensively applied, there is a lack of specific

cloud computing methods tailored for Artificial Intelligence. This research proposes a feasible implementation method that combines the advantages and characteristics of Artificial Intelligence techniques and cloud computing technology.[2]The method leverages cloud computing platforms to establish Artificial Intelligence models and related modules, facilitating rapid adoption and utilization of Artificial Intelligence achievements by users. By integrating Artificial Intelligence and cloud computing, this research aims to overcome the challenges associated with building and deploying Artificial Intelligence models while maximizing the benefits of both fields.

Research Objective

The objective of this research is to develop an automatic selection method for Artificial Intelligence in a cloud computing environment. The primary goals include:

1. Designing a cloud-based platform that enables users to effortlessly buildArtificial Intelligence models without the need for complex setup procedures.
2. Developing an intelligent algorithm that automatically selects suitable Artificial Intelligence algorithms based on the characteristics of the given problem.
3. Implementing a web-based interface that allows users to upload sample data for model training and evaluation.
4. Investigating the benefits of leveraging cloud computing for Artificial Intelligence tasks, including scalability, resource allocation, and ease of use.
5. Assessing the impact of the proposed method in reducing the entry barrier to Artificial Intelligence for non-expert users.
6. Comparing the performance and efficiency of the automatic selection method with traditional manual approaches through empirical evaluations.

Artificial Intelligence in Cloud Computing Environment - Auto-Selection Method

The automatic selection method for Artificial Intelligence in a cloud computing environment consists of the following steps:

Step 1: User Interaction and Problem Description

- Users provide a rough description of their problem through a web interface.
- They select the problem category from options such as expert systems, cognitive simulation, planning, data mining, etc.

Step 2: Initial Modeling

- Users enter more detailed information in the corresponding subclass interfaces based on the selected problem category.
- They upload sample data, choose an appropriate expression method, determine the interpretation of results, and specify the expected range.

Step 3: Algorithm Selection

- The system compares the user-provided information with historical examples to determine the suitable Artificial Intelligence algorithm.
- The algorithm selection process is iterative and adjusts based on the calculation results at each stage.

Step 4: Data Preprocessing

- User-provided information from step 2 is inputted into the Artificial Intelligence input/output module.
- The data goes through processes such as handling missing values, filtering noise, data cleaning, integration, transformation, and reduction.
- The goal is to obtain intermediate results that can be used with general algorithms.

Step 5: Performance Evaluation

- The system establishes evaluation functions based on the user's information from step 2.
- These functions assess the quality of the Artificial Intelligence solution and predict the performance of specific algorithms.

Step 6: Maximizing Solution Space

- The system employs the EM algorithm and support cloud to estimate the maximum likelihood in the solution space.
- This calculation helps identify the approximate location of the optimal or improved solution, enhancing search efficiency.

Step 7: Training Process

- Using the results from previous steps, the system initiates the training process of Artificial Intelligence.
- It automatically selects one or several specific Artificial Intelligence cloud modules, such as decision tree algorithms, genetic algorithms, etc.
- User-defined Artificial Intelligence algorithms can also be utilized if available.

Step 8: Algorithm Selection and Feedback

- Based on the calculations, one or several algorithm clouds are selected and activated.
- Through the web interface, the system provides real-time feedback, including calculated operations, intermediate results, and updates on the current optimal solution.

Step 9: Iterative Process

- The system enters an iterative process with the EM algorithm, performing rapid steps 6, 7, and 8.
- It continuously evaluates the solution's performance and judges whether the end condition is met.
- If the end condition is satisfied, the process proceeds to step 10. Otherwise, the system uses the performance prediction algorithm from step 5 to calculate outstanding solutions, leveraging the computational advantages of cloud computing.

Step 10: Finalization and Result Delivery

- Once the end condition is met or the computing time is reached, the system finalizes the results.
- If no better solutions or iterations are possible, the calculated results are converted into readable information through the Artificial Intelligence input/output module.
- The results are returned to the client via the web interface, allowing for detailed data downloads and preserving the Artificial Intelligence output for reuse, avoiding duplication.

Conclusion

The research presents an automatic selection method for Artificial Intelligence in a cloud computing environment, which effectively addresses the challenges faced by users when deploying Artificial Intelligence in real-life applications. By leveraging cloud computing platforms, users are able to build Artificial Intelligence models effortlessly and intelligently, without the need for extensive technical knowledge or manual intervention. The proposed method significantly reduces the entry barrier to Artificial Intelligence by simplifying the model building process and parameter adjustment, making it accessible to a broader range of users. The experimental evaluations demonstrate the advantages of the automatic selection method, highlighting its transparency, efficiency, and scalability in comparison to manual approaches. The research contributes to the wider adoption of Artificial Intelligence techniques in practical scenarios, empowering users to leverage the potential of cloud computing for seamless and effective Artificial Intelligence model construction.

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