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Design and implementation of artificial intelligence fusion experimental platform based on machine learning algorithm

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Abstract: *The platform is a platform for learning artificial intelligence algorithm services. It provides users with artificial intelligence algorithm learning tools, visual algorithm models, drawing functions, online running code and other functions. In addition, users can exchange their learning experience and experience with other users in the platform through the learning communication page. Through this platform, users can not only learn and apply artificial intelligence algorithms, but also have other functions, such as blog communication, function image drawing, neural network structure visualization, intelligent voice assistant and virtual interactive assistant, which are functionally perfect and easy to use. There is a tremendous talent gap in the field of artificial intelligence in China. The platform can effectively help learners learn artificial intelligence. Algorithm visualization makes learning more visualized. The interesting function of the platform increases entertainment, promotes users ' learning motivation, and adapts to the current development of our country.*

Keywords: *machine learning algorithm, artificial intelligence, platform, Web*

1. Introduction

Artificial intelligence is a branch of computer science. It is an emerging science and technology that explores the theories, methods and application systems used to imitate and expand human intelligent thinking. Machine learning is the core part of artificial intelligence.[1] In today 's big data era, artificial intelligence and machine learning related technologies have penetrated into all walks of life.[2] Students and engineers hope to promote the application of artificial intelligence in learning and life by learning artificial intelligence technology. However, in the learning process, the modeling process of artificial intelligence algorithm is complex and abstract, and the conceptual knowledge is also very boring and difficult to understand. Many existing learning platforms do not support the visualization of algorithms. To this end, we have created an artificial intelligence algorithm-assisted learning experimental platform that can visualize artificial intelligence algorithms and multi-function simultaneously.

The experimental platform is a Web-based AI algorithm fusion experimental platform [3], which is used to help learners understand the operation mechanism of multiple artificial intelligence algorithms, analyze the fundamental principles of related algorithms such as machine learning and neural networks, and visualize their core principles. This product can be applied to students' knowledge learning, assisting teachers ' teaching, and other people or enterprises who need artificial intelligence learning.

2. Key function

2.1 Algorithmic tool

NLP experience: intelligent voice robot small M [4]; t distribution table, arbitrary logarithm, power index calculation, provide formulas, and calculate by setting parameters. The function drawer provides users with support function input methods and input examples, and supports multiple functions. The user draws the image by inputting the expected function expression, and the same coordinate system can draw two functions at the same time.

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2.2 Algorithm visualization

Our platform currently has six visualization algorithms: linear regression, K-nearest neighbor algorithm, decision tree, neural network, logistic regression and support vector machine. In addition to introducing the basic knowledge of the algorithm, providing the corresponding Python code and example analysis, each article also has the function of parameter adjustment for image rendering and dynamic interactive image display. In addition, we added the decision tree construction process graph visualization and visualization to build the neural network structure, the former to help users more in-depth understanding of the decision tree construction process, the latter users by adjusting the function parameters clearly observed changes in different layers.

2.3 Learning exchange and personal center

This function section is similar to the forum function. After the user logs in, the user can publish a personal learning blog and comment on other articles. At the same time, the platform combines the intelligent recommendation algorithm based on LightFM [5] for daily recommendation. The recommended content is inspirational sentences, historical today, professional knowledge, English learning, which broadens the user's knowledge. In the lower left corner of the interface, there is our virtual intelligent interactive role, kanbanniang, with seven models, including cats and dogs, two-dimensional girls, two-dimensional boys and other models. The system will automatically replace it in a month cycle, which can communicate and help readers relax. User editing articles are Kindeditor editors, which have a variety of editing functions for users to use. Figure 1 shows the Kindeditor editor page.

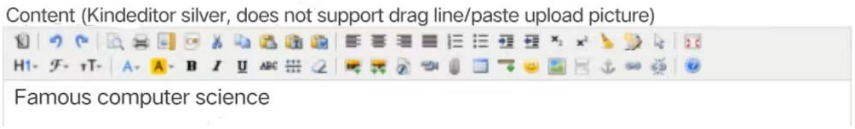

Figure 1: Kindeditor editor page

2.4 CodeEditor

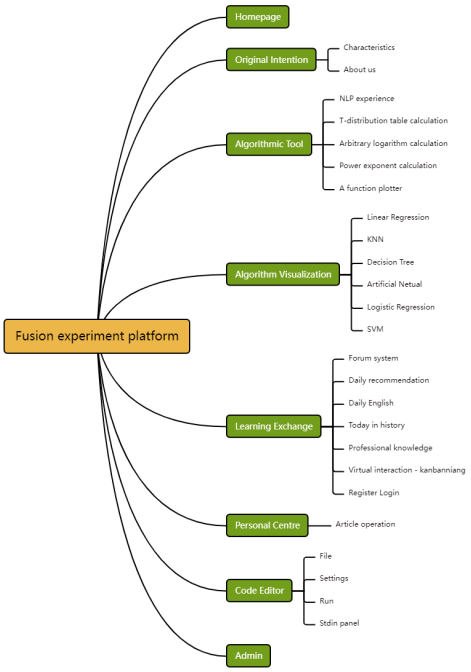

Figure 2: Functional overview of artificial intelligence fusion experimental platform

The interface is a web page online runtime, the user can enter the code, click on the run to get the output of the content, and show the running time. The foldable stdin panel can be expanded, and the setting function can set whether to automatically change lines. The file function can choose to download the online edited code to the local to form a.py file or upload the local source code file to the

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online editor.

The following Figure 2 is an overview of the functions of the artificial intelligence fusion experimental platform:

3. Summary design

3.1 Front-end module

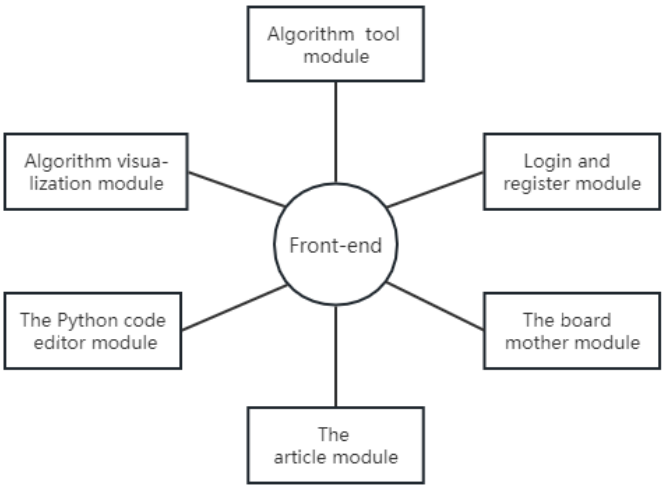

Figure 3: Front-end module composition

Front-end module composition is shown in Figure 3.

①Algorithm visualization module: it mainly uses MathJax, jQuery, BootStrap and other front-end technologies to realize visualization. When the slider changes dynamically, the parameters also change dynamically, and the points and equation images displayed in the coordinate system change accordingly, including drawing straight lines according to slope and intercept, calculating gradient according to initial point and learning rate constant, determining category according to horizontal and vertical coordinates and k value, constructing a tree according to initial state, and visualizing neural structure through neural network layer code combination.

②The Python code editor module mainly uses CodeMirror component, jQuery, Bootstrap and other front-end technologies to realize the Python code editor function. When the current end enters the code, it can click and run to use the component to realize the effect of the code running in the web page. At the same time, it can also use the click input function to perform input interaction, import and export files, etc.

③Algorithm tool module: it is mainly realized by MathJax, Tuling OpenApi and other technologies. Users can use it interactively, including inputting content, small M robot can chat with you and display the chat content on the screen and play it out through voice.

④Login and registration module: it is mainly through Ajax to pass the front-end data to the back-end for data legitimacy verification, in which the registered input image can be saved in the back-end Media folder and can be accessed.

⑤The article module: it is mainly through the introduction of Kindeditor article editor, Ajax implementation, including additions and deletions to modify the article, likes, comments and other functions, increase the article when the article title, content, labels, classification, etc. through the Form form POST method to the back-end, the back-end data processing (anti-XSS attack) after storage and display; the content of users ' likes and comments is passed to the back-end for storage through Ajax technology.

⑥The board mother module: it is mainly through the introduction of live2d-widget @ latest components to achieve the board mother.

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3.2 Back-end module

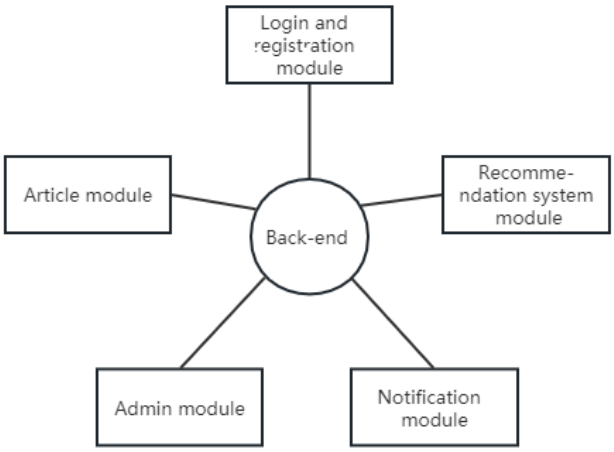

Figure 4: Back-end module composition

Back-end module composition is shown in Figure 4.

①Login and registration module: receive the data from the front end, verify the legitimacy through the Django Forms component, and use Django ORM to store the data.

②Article module: Receive the data from the front end, use the BeautifulSoup module to filter the content, remove the script tag content, prevent XSS attacks, prevent the database from being maliciously modified [6], and use Django ORM to store data.

③Admin module: site administrator use, can control group permissions, view the content of all database tables, support precise search, fuzzy search, switch themes, modify font size, view operation history and other functions.

④Notification module: when receiving the feedback from the user and the article published by a user receives the likes, comments and other content, the back-end administrator mailbox will automatically send information to the user 's mailbox for notification.

⑤Recommendation system module: The recommendation algorithm is mainly based on LightFM. According to the user's browsing record and the label of the published article, it recommends personalized content for the user in the daily recommendation.

3.3 Overall module

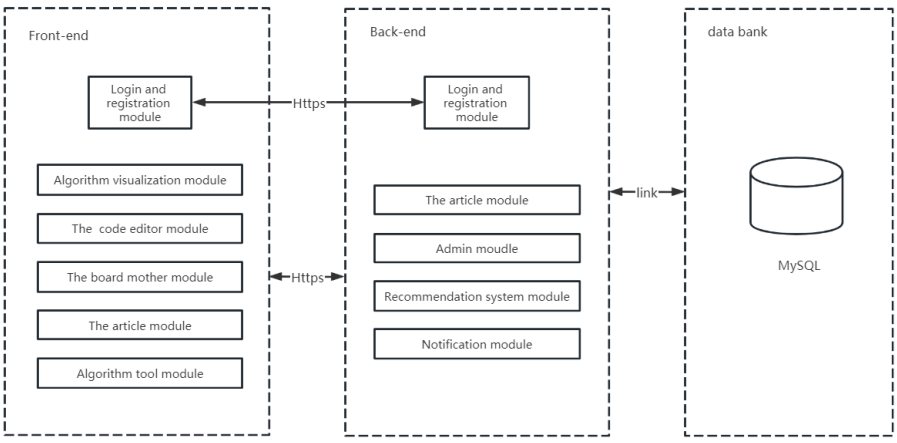

Figure 5: Front-end and back-end interaction with the database

The system can be divided into three parts: front-end, back-end and database. In the actual development process, it is also designed and developed according to such a hierarchical structure. In

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the development, the organization is clear, the structure is clear and easy to understand. The following Figure 5 is a front-end and back-end interaction with the database.

4. Detail design

4.1 Interaction design

1) Front-end structure

The front end of this system adopts MVVM architecture. MVVM (Model-View-ViewModel) is essentially an improved version of MVC architecture. It is a new architecture developed by combining MVP (Model-View-Presenter) mode with WPF. It helps to separate the development of graphical user interface from the development of business logic or modeling logic (data model).

Based on the idea of MVC desktop applications. In the front page, the model is represented by a pure JavaScript object, and View is responsible for display. The two achieve maximum separation. The following Figure 6 is a systemfront-end architecture diagram.

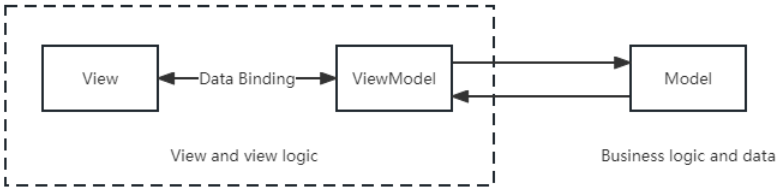

Figure 6: System front-end architecture diagram

2) Back-end architecture

The back-end uses the MVC architecture. The MVC model consists of three parts: Model-internal data processing (add, delete, modify, check), View-data representation (presented to the user in the form of an interface) and Controller-input and output control (data interaction). The following Figure 7 is a system back-end architecture diagram.

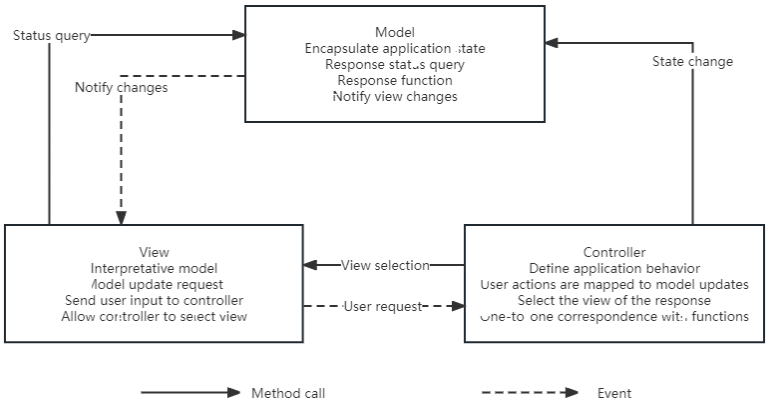

Figure 7: System back-end architecture diagram

3) Development framework

①Vue

Vue.js (hereinafter referred to as Vue) can be considered as the latest framework in today's MVVM architecture. It was born with the concept of integrating multiple frameworks. Vue makes full use of the advantages of AngularJS and React and integrates them into a library.

Development advantages:1) easy to learn, Vue learning curve is very small, and it is easy to integrate into the project. 2) Vue provides Vue-router components for routing management, which is perfectly compatible with the concept of front-end and back-end separation development.3) JavaScript support, Vue is perfect for JavaScript support, and any JavaScript component can be run in Vue.4.

②jQuery

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jQuery is a fast and simple JavaScript framework, which is another excellent JavaScript code library (framework) after Prototype. The purpose of jQuery design is ' Write Less, Do More', which advocates writing less code and doing more things. It encapsulates the functional code commonly used in JavaScript, provides a simple JavaScript design pattern, optimizes HTML document operation, event processing, animation design and Ajax interaction.

Development advantages: 1) with a unique chain syntax and short clear multi-functional interface. 2) with efficient and flexible CSS selector, and CSS selector can be extended.3) Has a convenient plug-in extension mechanism and rich plug-ins.4) Compatible with various mainstream browsers.

③Django

As a web framework of Python, Django has the following characteristics: 1) Completeness. Django provides developers with all the ' out of the box ' features they may want. 2) Generality, Django can be used to build almost all types of websites. 3) Security 4) Maintainability. Django follows the design principles in code writing and encourages the creation of maintainable and reusable code. 5) Flexibility, Django can run on many platforms.

④LightFM

LightFM is a popular recommendation algorithm implemented in Python for implicit and explicit feedback, including efficient implementation of BPR and WARP ranking loss. It is easy to use, fast (through multi-threaded model estimation), and produces high-quality results.

4.2 Database design

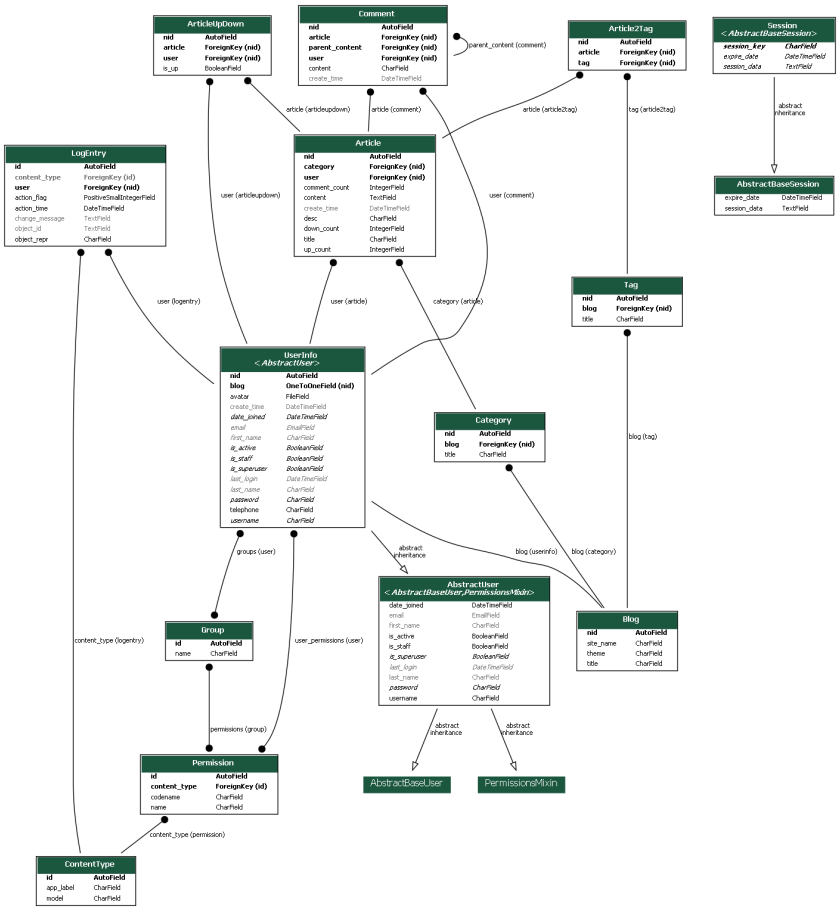

Figure 8: Database ER diagram

1) Follow the principle [7]

①In the event of an exception, the application is allowed to process accordingly.

②The error information displayed to the user should clearly describe what happened and what kind

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of treatment should be taken.

③If auxiliary information is needed, the error message also helps the user interact with the help department, providing the necessary information for the help department team so that they can quickly and easily reproduce the error.

④Log information can provide necessary information for the development team to identify errors, locate the location of errors in application code, and correct errors.

⑤Error handling code does not reduce the readability of application code. When necessary, error handling is only a safety net, which has low access to the core functions of the application, as shown in Figure 8.

2) Platform specific surface structure design

4.3 Key technology

1) Front-end: jQuery framework, Vue framework, MathJax component, Bootstrap framework, Kindeditor component, live2d-widget @ latest component.

2) Backend: Django framework, Django REST framework, Simple UI plug-in, Admin component, ORM component.

3) Database: MySQL.

4) Recommended algorithm: LightFM.

5. Conclusion

China has a large talent gap in the field of artificial intelligence. In recent years, colleges and universities in China have successively opened artificial intelligence majors, focusing on cultivating talents in the field of comprehensive development artificial intelligence [8]. However, the resources existing on the network are very scattered, coupled with the high abstraction of artificial intelligence algorithms, and the existing learning platform does not have the function of visual algorithms, so it is very easy to persuade beginners to withdraw. Therefore, we have created an idea to build an artificial intelligence fusion experimental platform. We want to help more people in need to understand and learn about artificial intelligence related technologies, and also want more people to actively participate in the study of artificial intelligence. For this platform, its biggest feature is algorithm visualization. It will make learning artificial intelligence algorithms more visualized and intelligent. The fun function of the platform will increase entertainment and promote users ' learning enthusiasm. In the future, we will combine the advantages of low-code platforms, visualize algorithms while supporting algorithm drag-and-drop implementations, and combine with today 's hot technology cloud computing to achieve the purpose of learning AI with AI anytime and anywhere.

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