Retraction

Retracted: Practical Thinking of Neo-Confucianism in Qing Dynasty from the Scope of Practice Based on Deep Learning

Mathematical Problems in Engineering

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Deng and T. B. Chuan, "Practical Thinking of Neo-Confucianism in Qing Dynasty from the Scope of Practice Based on Deep Learning," *Mathematical Problems in Engineering*, vol. 2022, Article ID 8284696, 9 pages, 2022.

Research Article

Practical Thinking of Neo-Confucianism in Qing Dynasty from the Scope of Practice Based on Deep Learning

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As the mainstream of Confucianism, the Song and Ming philosophies played an irreplaceable role in the 800 years of history from the Song dynasty to the end of the Qing dynasty. The theoreticians were concerned with the principles of heaven, nature, and physics and especially with the principles of human nature, which changed in the Qing Dynasty to a practice-oriented way of thinking. However, the practical thinking of Qing dynasty Neo-Confucianism is difficult to apply to practice because of the obscure text and the limitations of the time period, so it is worth further discussing how to deconstruct and promote the learning of Qing dynasty practical thinking under the new technology. This paper systematically reviews the ideological origins and political practices of Qing dynasty Neo-Confucianism and proposes a knowledge-tracking model around deep learning technology, which not only provides a contemporary technological tool for deconstructing the practical thinking of Qing dynasty Neo-Confucianism but also provides an application path for the integration of technology and knowledge.

1. Introduction

The Qing Dynasty was an important watershed in the history of Chinese scholarship. The scholarly development of this period was not only a summary of two thousand years of traditional scholarship but also a precursor of modern scholarship. The history of Qing Dynasty scholarship has been a hot topic of research, and its understanding is constantly being updated. However, as far as the history of Qing studies is concerned, it has been questioned since the phrase "Qing Dynasty Neo-Confucianism is exhausted and there is no residue of it" [1], and it has come to a deadlock. In order to break this deadlock, it is necessary to conduct a systematic, comprehensive, and profound investigation of the way of thinking of Neo-Confucianism in the Qing dynasty.

From the viewpoint of the history of thought and scholarship, the focus of the Neo-Confucianism of reasoning was on the theoretical experience and practice of the state of mind and work, which developed to the extreme in the late Ming Dynasty. The early Qing scholar Huang Zongxi had profound attainments in the science of reason, but he did not work as a scholar of reason, and his Confucianism only discerned the concepts of reason, mind, nature, etc. As an important school of traditional Confucianism, the science of reason was constantly socialized and played the role of the right and the left in the world, especially in the Qing Dynasty. Therefore, "writing theories with theories" was obviously incomplete, and even difficult to realize after the end of theories as a dominant form of theory. One important reason is that the work and the realm that belonged to the core of science could not be dealt with in detail from the perspective of academic history alone. Therefore, the study of the history of Qing Dynasty Neo-Confucianism must be integrated with the broader social life and culture in order to comprehensively and systematically interpret the changes and unique features of Qing Dynasty Neo-Confucianism at the concluding stage of traditional Chinese scholarship, in addition to having a firm grasp of the data [2]. It is only by combining the thinking of the history of ideas with the perspective of social and cultural history that the study of theories can be deepened.

In the practical application of Neo-Confucianism, the Qing scholars either promoted Cheng and Zhu or continued to adhere to Lu and Wang's philosophy of the mind, and all of them incorporated their practical ideas into their Neo-Confucianism and actively participated in the political practice of the Qing dynasty with the mission of restoring the broken social order and maintaining the long-term peace and stability of the country [3]. The emperors of the Qing dynasty also supported the famous scholars of science from the political point of view, ruled the country by science, and selected the contents of the thought and Neo-Confucianism of the famous scholars of science that were beneficial to the rule of the Qing dynasty. The political practice of the scholars was not only in line with the ideology of Neo-Confucianism for the benefit of the country and the people but also against it. There were complex social backgrounds and political factors behind this phenomenon, reflecting the contradiction between Confucian ideals and political reality. Importantly, the political practice of Qing dynasty Neo-Confucianism gave rise to practical thinking, which had a profound impact on later generations. However, along with the continuous development of society, the practical thinking of Qing Dynasty Neo-Confucianism has been gradually replaced by instrumental rationality and has been declining. Therefore, under the boom of artificial intelligence, how to effectively apply artificial intelligence technology to the simulation of practical thinking has become an important research issue.

This paper attempts to simulate practical thinking in Qing dynasty Neo-Confucianism using deep learning techniques and proposes a corresponding improved knowledge-tracking model in order to provide a channel for the contemporary dissemination and promotion of practical thinking in Qing dynasty Neo-Confucianism, as well as an application basis for the integration of technology and knowledge.

2. Literature Review

Because of the multiple aspects of Ming and Qing scholarship, the academic turn in Ming and Qing dynasties was a holistic turn in various intellectual disciplines such as scriptures, history, sons, and collections and was neither a linear evolution nor a narrow change from Song and Ming scholarship to Qing dynasty koanology or Neo-Confucianism, koanology, "respect for virtue," and "Daoist scholarship." The change is not a linear evolution, nor is it a narrow shift from Song and Ming dynasties to Qing dynasty koans, or science, koans, "respect for virtue," or "Taoism." Among them, although the science was in crisis, it was not hopeless, and the inclusive "early Qing new Neo-Confucianism" came into being and became the bridge between the mainstream of early Qing scholarship and the transformation of Ming and Qing scholarship, and the source of all schools of Qing scholarship. In other words, the academic transformation of the Ming and Qing dynasties was not a "one-step process" from science to koanology, as traditionally believed, but a "two-step process."

In the social crisis of the Ming and Qing dynasties, Song and Ming schools of thought were transformed into "early Qing new Neo-Confucianism" and from "early Qing new Neo-Confucianism," Qing dynasty Neo-Confucianism, koanology, and Tongcheng school were transformed. Reflected in politics, the "early Qing Neo-Confucianism" also had a great impact on early Qing dynasty politics.

As a bridge to the academic turn of the Ming and Qing dynasties and the crystallization of the collective wisdom of the Qing scholarship, Qing Neo-Confucianism defended the basic values of Neo-Confucianism, faced the broad social reality, and sought a new way to unite the scholars and Sinicize the foreigners. Wang Guowei's statement that "the early state learning was great" and Qian Mu's statement that "the new world of Neo-Confucian thought in the Qing dynasty" originated from the shaping of this Neo-Confucianism in the first place.

2.1. Neo-Confucianism in Qing Dynasty. Compared with Song and Ming Neo-Confucianism, Qing Neo-Confucianism changed in two major ways: firstly, it promoted a problem-oriented approach to learning and was committed to the inclusion of Cheng-Zhu Neo-Confucianism, Lu-Wang Xinxue, and other Neo-Confucian resources, with a focus on "righteousness" and abandonment and absorption, unlike the previous strict gateway. Secondly, the focus of practice is on solving realistic problems rather than being confined to metaphysical thinking or ethical dogma, moving from discursive lectures to kung fu theory and institutional criticism, taking kung fu theory and institutional criticism as the base, integrating inner sainthood and outer kingdom, developing theoretical innovation and moral practice at the same time, and taking metaphysical "reason" and metaphysical "reason" and metaphysical "reason" together. "It is for these two reasons that the Qing dynasty's philosophy was developed. It was for these two reasons that the leading figures of the Qing Neo-Confucianism were all academic and moral icons [4].

In terms of academic style, they were inclusive, and they accepted both literature and martial arts and used both chivalry and Confucianism. In the north, Sun Qifeng said, "Begin with the heroes and end with the sages." In the Ming Dynasty, during the Tianqi period, the eunuch Wei Zhongxian dictated power and disorderly government and ruthlessly cracked down on the ministers who impeached him for his sins, Zuo Guangdou, Wei Dazhong, and Zhou Shunchang were the first to be arrested. Although the rescue operation failed, Zuo, Wei, and Zhou died, but Sun Qifeng still saved their relatives. As Sun Qifeng, Lu Zheng, and Zhang Guozhong were in a hurry, "the righteousness of the people was high in the sea, and they were known as the "three martyrs of Fangyang'." Sun Qifeng is familiar with the art of war, in the Ming and Qing dynasties, leading the people to fight against all sides of the attack, to ensure the peace of the party. In 1636, Huang taiji became emperor and at the same time sent troops to break through the Great Wall and approach Baoding, the surrounding cities fell one after another; but under Sun Qifeng's leadership, the people of Rongcheng rose up to resist and were saved. Therefore, the History of the Ming Dynasty directly positioned Sun Qifeng

as a "knightly warrior." Wang Yuyou "studied the art of war under Sun Qifeng" and wrote "The Outline of Qiankun" and "The Thirteen Swords," which were dedicated to the convergence of the new Confucianism, martial arts, and military science. The "Ontario" is the first work of military theory in the history of Chinese military books that discusses the principles of strategy from the perspective of the beginning soldier." In this book, Wang Yu-you put forward the idea of "attracting force with the sword," which had an important influence on the thought of Chinese swordplay. The Yan-Li school was based on Xia Feng's northern school, which pushed the style of both literature and martial arts, chivalry, and Confucianism to the climax. As late as 1917, Mao Zedong, in his first published article, "Study of Sports," praised Yan Yuan's academic style of "both literature and martial arts."

In the south, Huang Zongxi changed three times in his life: "first he was imprisoned as a party member, then he was referred to as a ranger, and finally he was toileted in the Confucian forest. In the early years of Chongzhen, Huang Zongxi avenged his father's death by stabbing the eunuch Xu Xianchun with a cone in his sleeve, beating Cui Yingyuan in public, and plucking his beard to his father's spirit. After the Qing army conquered Nanjing, the King of Lu supervised the country and recruited volunteer soldiers with the old East Foresters in an attempt to recover, and his troops were called "Huang's Shizhong Battalion." He also begged for a teacher in Japan, but after several hardships, he did not succeed. In the "Epitaph of Wang Zhengnan," Huang Zongxi clarified for the first time in the history of Chinese martial arts, the "internal martial arts," which are "to be calm and braked, the offender will fall down when he is attacked," and the "external martial arts," which are "famous for their courage and their ability to fight people." The difference between the "internal martial arts" and the "external martial arts," which are "famous for their courage and their ability to fight. Gu Yanwu, after the Qing army entered the country, served as the minister of military affairs in the Hongguang dynasty of the Southern Ming Dynasty, and wrote "Theory of Military System," "Theory of Situation," "Theory of Tian Gong," and "Theory of Money Law." After the Qing army sacked Nanjing, Gu Yanwu joined Wang Yongjo's volunteer army and joined forces with Guizhuang and Wu Zhihui and Lu Zhiyu to solve the siege of Kunshan, but failed to do so. Gu Yanwu's birth mother, He, lost her right arm to the Qing army, and his heir mother, Wang, died of hunger strike, ordering him not to serve the Qing for the rest of his life. He was not allowed to work for the Qing Dynasty for the rest of his life. Gu Yanwu visited the Ming Mausoleum six times and was framed by his enemies. Wang Fuzhi raised an army against the Qing Dynasty in Hengyang in the fifth year of the reign of Shunzhi and blocked the southward movement of the Qing army, but he was defeated and retreated to Zhaoqing.

In terms of attitude toward Song and Ming Neo-Confucianism, Qing Neo-Confucianism was committed to rebalancing the basic values of Neo-Confucianism with social reality, reconstructing the relationship between heaven and man, ritual, and human feelings, and the relationship between Lu Wang Xinxue and Cheng Zhu Neo-Confucianism, and constructing a new consensus to unite more Han scholars. If we take a broader view, the Neo-Confucians of the Qing Dynasty, on the one hand, devoted themselves to the abandonment of Song and Ming Neo-Confucianism, and on the other hand, starting from the theme of the times, launched a powerful movement to return to the classics and reinterpret them. It was the continuous induction of this inclusive "New Confucianism" that led to a new period of expansion and peak of Han culture. Wang Fuzhi's patriarch Zhang Zai, compatible with the late Ming Donglin party and Lao Zhuang, Buddhism some resources, "revised Cheng Zhu, opposed to Lu Wang," historical philosophy opened up a new world. Huang Zongxi inherited from Wang Yangming and Liu Zongzhou, and opened up to Wan Sitong and Zhang Xuecheng, talking about "all qi in heaven and Earth," focusing on qi theory, emphasizing the integration of history with scripture, and opening up the academic precedent of Zhejiang East in the Qing Dynasty. He also wrote the book "Ming Yi Zu Zhuan Lu," criticizing the monarchy. Gu Yanwu "said that there is no other so-called new Confucianism in the past and present and that scripture is the new Confucianism. He also wrote "The Book of the Day" and "The Book of the Sick," talking about "the rise and fall of the world is the responsibility of every man" and other doctrines" [5].

In terms of academic thinking, Neo-Confucianism in the Qing dynasty was a departure from the dogmatic approach of Neo-Confucianism in the late Ming dynasty and was based on the social situation and themes of the time. From the perspective of Chinese and Western history, the 17th century was a time of many crises. In the West, the economic situation, which had recovered and developed vigorously in the 15th and 16th centuries, suddenly fell into a trough in the 17th century and seemed to be returning to the 14th century. Spain and Italy were declining, France and Germany were struggling, and there was a return to slavery in Eastern Europe. Thus, in the second volume of his Modern World System, the famous modern Western scholar Wallerstein entitled the preface "The Crisis of the Seventeenth Century." In China, the internal manifestation was the dramatic Ming and Qing dynasties. First, within the Ming Dynasty, political corruption and eunuch dictatorship led to peasant uprisings that swept across vast areas of Shaanxi, Shanxi, Henan, Hubei, and Sichuan. The Qing army then entered the country and used force as a backing to break the Southern Ming, the peasant army and then the three clans and other forces, and only after the Qing government recovered Taiwan in 1684 did it become stable; externally, the geographical environment around the Ming Dynasty deteriorated. In the north, Nurhachi established the Later Jin in 1616, captured Liaoshen in 1621, and then continued to move south to northern China; in the south, following the Portuguese occupation of Macau, the Dutch and English colonists arrived one after another, and the Dutch occupied Taiwan for 38 years (1626–1662). In short, economic decline, population decline, social unrest, and regime change became common phenomena in the East and West in the 17th century. Academics never existed in isolation, especially in

imperial China, where great social crises were often accompanied by dramatic academic shifts. The academic turn in the Ming and Qing dynasties was a reflection of the crisis in China in the 17th century. As the situation became more stable, the schools of "Qing Neo-Confucianism" were oriented toward the social problems themselves, which were induced by the crisis of the 17th century, and devoted themselves to solving the crisis of the 17th century with the idea of "New People's Principles." They criticized the monarchical dictatorship and constructed a series of reconstruction programs. Based on the idea that the world was public and the ruler and his subjects ruled together, they discussed "ruling the people" and "ruling the law," the relationship between the scholar, the farmer, the businessman, the ruler, and the subject, and the relationship between the ruler and the people [6].

2.2. Political Practice of Neo-Confucianism in Qing Dynasty. The idea of nationalism, the idea of discrimination between yi and xia, was on the rise. In the face of the Qing government's brutal national oppression, the "Chinese/Yi distinction" also became one of the focal points of the new Confucianism. Among them, Wang Fuzhi was the most thorough, but it was Lv Luliang who had the most sensational impact in the Qing Dynasty. Lv Liuliang learned from Cheng Zhu, and strictly adhered to the tenet that "the distinction between China and yi" was superior to "the righteousness of rulers and subjects." He believed that "the discernment between Chinese and foreigners" was the highest tenet of Confucianism, and that it was the place where Confucius made the "Spring and Autumn Annals," which was "the great meaning of the small words." He was not only unhappy with Guan Zhong's death but also praised him for his benevolence and righteousness because he was able to save the Central Plains from being "overlapped by the left overlapping hair" by uniting all the lords. In the Yongzheng dynasty, Zeng Jing, a Confucian scholar from Hunan, was influenced by him to lobby Yue Zhongqi, the governor of Sichuan and Shaanxi, to rise up against the Qing Dynasty, and his deeds were exposed. The sons, grandsons, and disciples were either killed or beheaded or sent into slavery, the suffering was so severe that it was the first of the Qing Dynasty's written prisons. Wang Fuzhi wrote "The Yellow Book" to sort out the history of the Han people. He argued that, although the predecessor of the Han Chinese may have been similar to the barbarians in the early years of civilization, there was a natural civilizational divide between the Chinese and the barbarians after the formation of the Han Chinese, and all peoples had to adhere to their places of origin and not mix with each other. At the same time, because of the civilizational divide between China and the barbarians, the morality of the two cannot be confused, and Han loyalty, filial piety, and benevolence cannot be applied to the barbarians. And, divided the water and fire."

The relationship between Taoism and governance, in the face of the serious conflict between Manchu and Han in the Qing Dynasty but the reality of the gradual Sinicization of the Qing government, the new Confucianism of the Qing Dynasty, on the one hand, insisted on the supremacy of Taoism but also paid attention to harmonizing the relationship with governance and even made concessions to the Qing government so that the conflict between the two did not intensify as in the late Ming Dynasty, on the other hand, united more Han scholars to promote the Sinicization of Manchus. The Qing dynasty is an era of China's practical thinking, a prominent feature of this period of practical thinking is to focus on the outside king, focus on the world to apply. And, to be practical, in the imperial society, relying on the imperial power became the only way, for the so-called "king to do the way" is also. In the general trend of the Qing government's rule, although the criticism of the monarchy and the idea of "yi xia" due to national oppression were prevalent, it was inevitable to bow down to the Qing government in order to be useful. The Qing dynasty banned the assembly and association of scholars, and the "Kechang Case," "Tonghai Case," "Zhangshen Case," and "Crying Temple Case." Although ministers such as Wei Diji, Wei Xiangshu, and Ye Fangli participated in the rescue, the academy basically took the lead. "To realize the "politics of the king," it is most important to rely on the emperor. But on the other hand, the various schools of Neo-Confucianism in the Qing Dynasty, in order to accelerate the Hanization of the Qing Dynasty, contacted various forces and exerted various influences on the Qing government. For the sake of the country's livelihood, they not only acquiesced to their disciples' service to the Qing government but also interacted with Han officials who had surrendered to the Qing dynasty but had made real achievements in social and cultural development. For example, Sun Qifeng, although he personally led the villagers to resist the invasion of the Qing Dynasty in his early years, took the lead in consciously promoting the Hanization of the Manchus when the general situation had been settled, not only maintained good relations with the high officials and dignitaries of the Qing Dynasty and the second-tier ministers but also made positive comments on those people who had made achievements in promoting social and cultural development but were lacking in morality.

In terms of the main body and academic pattern, the Qing dynasty legacy group was the main body of the Qing dynasty Neo-Confucianism, and at one time Northern Qing dynasty Neo-Confucianism led the trend. The group of Qing dynasty relics was the leading figure of Qing dynasty scholarship and the main body of Qing dynasty Neo-Confucianism. On the one hand, although they were small in number, they had a high reputation, great fame, and profound skills, and each of them had established a doctrine, occupied the academic and moral high ground, and their disciples and disciples were all over the court and field and responded to all calls. Therefore, it is easy to understand how they could dominate the Qing scholarship and be drawn in by all parties. Tang Bin, for example, was one of Sun Qifeng's famous disciples and an important Neo-Confucianist of the Qing Dynasty [7].

In short, the reconstruction of the academic landscape and leaders in the Qing Dynasty reflects the great changes in the regional academic landscape since the Qing Dynasty. In

the early Qing Dynasty, since the great changes in the Ming and Qing Dynasties first broke out in the north and gradually advanced from the north to the south, the new northern scholasticism emerged in the early Qing academic landscape and once led the trend, which was reflected in the leading figures, two of the three great Confucians of the early Qing Dynasty. Since the late Qing Dynasty, the academic landscape has undergone significant changes in step with social changes: from the Qian and Jia periods, intellectuals from the two lakes and Guangdong began to rise, and in modern times, echoing the already flourishing Jiangsu and Zhejiang regions, two major "talent belts" were formed, centered on Jiangsu and Zhejiang regions and along the Guangzhou-Changsha-Wuhan line. The "talent belt." The strong intention of these two talent belts to construct regional culture and related schools of thought is deeply hidden behind the writing of modern Chinese history. In this process, Gu Yanwu, Huang Zongxi, and Wang Fuzhi, as academic icons and regional sages, received much attention from the intellectuals of Jiangsu, Zhejiang, and Hunan in modern times. The "Three Great Masters" of the Qing Dynasty were rooted in the themes of the times and the regional academic pattern and were the result of the combined effect of the above-mentioned historical and practical factors. Therefore, despite the fact that in modern times, the scholarly circles have also seen various references to the "Four Great Confucians of the late Ming Dynasty," "Four Great Confucians of the Qing Dynasty," and "Five Masters of the Qing Dynasty." However, none of them could shake the status of the "Three Great Masters" of the Qing Dynasty.

However, along with the development of the times and society, although the practical thinking of Qing dynasty Neo-Confucianism is still significant in contemporary times as an abstract way of thinking, the decline of the overall doctrine has led to its practical thinking being gradually abandoned and replaced by instrumental rationality. The emergence of artificial intelligence technology and the continuous updating of deep learning algorithms provide a technical path for extracting the practical way of thinking; importantly, the learning model represented by knowledge tracking also provides a channel for promoting and learning the practical thinking of the Qing dynasty Neo-Confucianism.

3. Methodology

How to use deep learning technology to extract the practical way of thinking of Qing Dynasty Neo-Confucianism and provide technical support to learners in the form of knowledge tracking is the difficulty of the specific application of technology in Neo-Confucian thinking. Therefore, this paper tries to improve the knowledge tracking model.

In this paper, we propose a fused multi-feature knowledge tracking model SGRUR@MECF, which first uses the LightGBM algorithm to evaluate the importance of the features in the dataset, selects the features with high importance as input features and performs one-hot encoding and cross-coding of the correct and additional features of student responses. Since the cross-coding of multiple features leads to the high dimensionality of the input data, an

autoencoder is used to compress the cross-multiple features, and then the compressed features are input to the prediction model [8, 9].

The SGRUR@MECF model proposed in this paper is a knowledge tracking model incorporating multiple features, and its model framework is shown in Figure 1.

The SGRUR@MECF model framework consists of four components: data preprocessing, feature selection, multifeature coding, and deep learning prediction [10]. In the data preprocessing stage, the metadata set is cleaned and organized to obtain a relatively complete data set. Finally, in the deep learning prediction stage, the compressed features are passed into the SGRUR model for student knowledge tracking and student performance prediction [11].

3.1. Multifeature Selection Algorithm.
The framework of the student performance prediction model based on the LightGBM algorithm is shown in Figure 2.

First, input the features of the student response data, use the histogram algorithm to find the feature with the greatest gain, and determine the optimal splitting point of the decision tree based on this feature; use the Leafwise leaf growth strategy with depth limitation to generate the CART tree; then calculate the residual value of the CART tree, use the residual result of the previous tree as the training sample, train the next CART tree, and repeat the training; finally, the CART tree generated by each training is weighted and summed to obtain the final prediction model. The CART trees generated from each training session are weighted and summed to obtain the final prediction model [12]. The LightGBM algorithm measures the importance of a feature attribute based on the total number of times the feature is used as a segmentation point. The feature elements are sorted from largest to smallest according to the attribute importance, and the search starts from the full set of all features, and the features with the lowest importance are removed or not according to the accuracy of the results; all the features are traversed and the optimal feature subset is output [13].

Let there be d features before feature selection and j features left after feature selection, so feature selection can be calculated by equation (1)-(3).

$$F = \{T_i | i = 1, 2, \ldots, d\}. \tag{1}$$

$$F_i = \text{LightGBM}(F). \tag{2}$$

$$\text{LightGBM}(F) = \{T_i | i = 1, 2, \ldots, j\}. \tag{3}$$

After filtering the dataset features by the LightGBM algorithm, multiple features need to be encoded to compose the input data [14]. In this paper, the direct splicing method is used.

The direct stitching method is to encode the response data and the optimal feature subset in onehot and then form a new input vector by stitching [15] as shown in Figure 3.

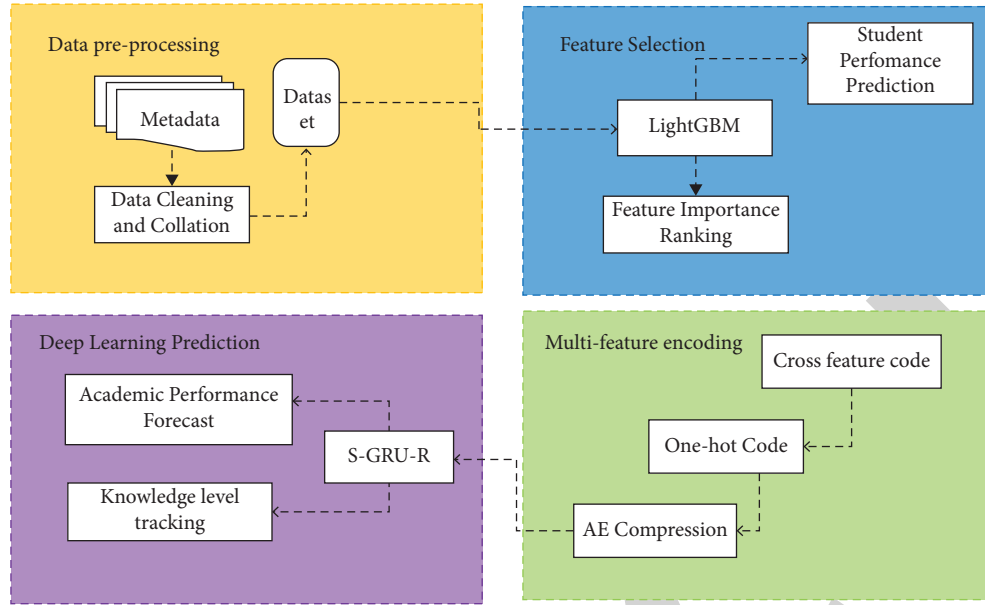The direct splicing method can be expressed by the following equation:
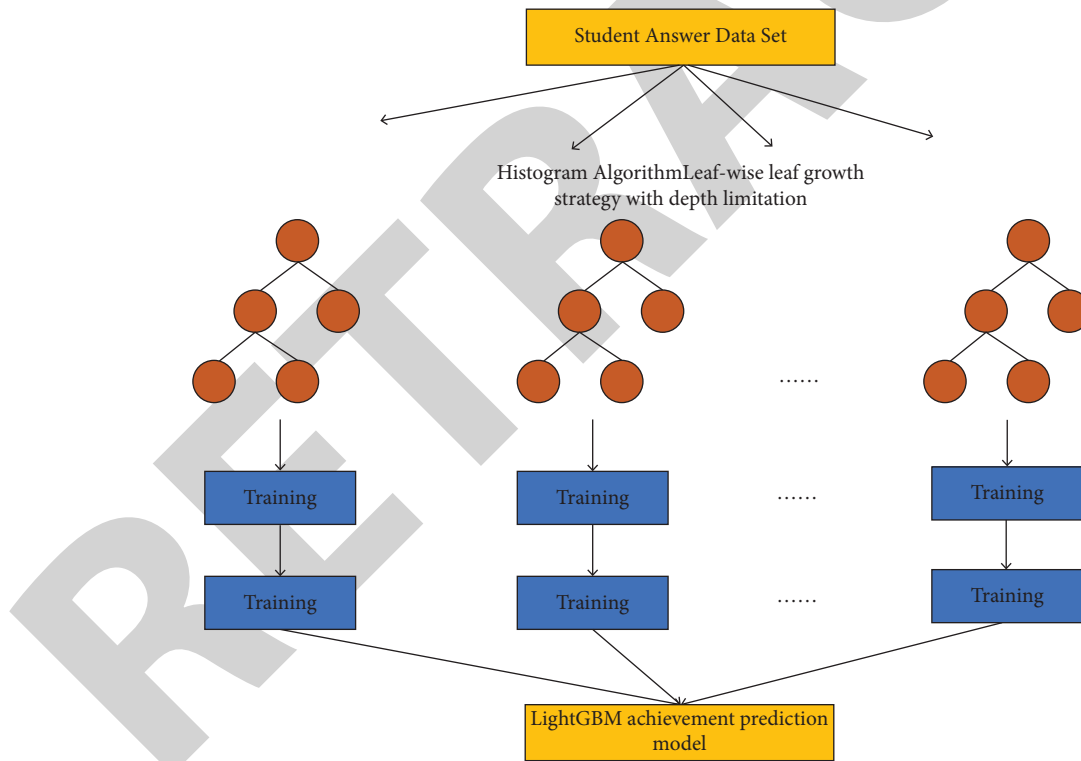
FIGURE 1: Framework for the SGRUR@MECF model.

FIGURE 2: Framework for the LightGBM achievement prediction model.

$$x_t = O(C_t) \oplus O(F_t). \qquad (4)$$

where C_t represents the student response data, F_t is the optimal subset of features selected by the LightGBM algorithm, and the function $O()$ represents the onehot encoding. The input x_t of the model can be obtained by the direct splicing method [16].

In addition, this paper modifies the direct splicing coding method for the practical thinking of Qing dynasty Neo-Confucianism, which can be expressed by equations (5)-(6).

$$C(s_t, c_t) = s_t + [\max(s) + 1]^* c_t. \qquad (5)$$

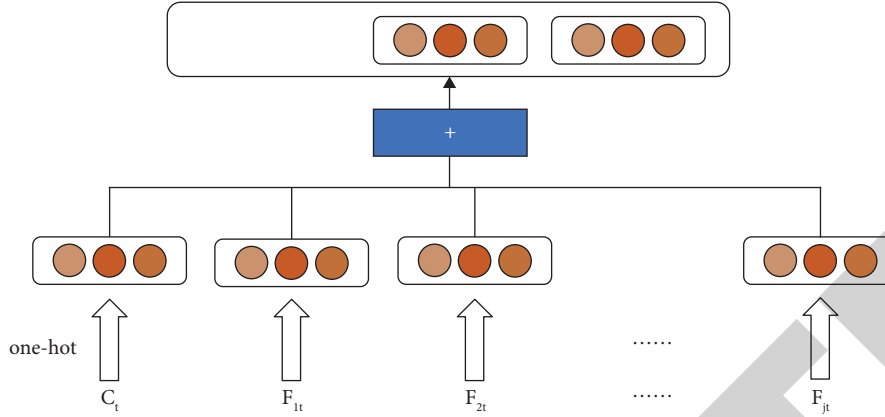$$x_t = O(C(s_t, c_t)) \oplus O(C(F_t, c_t)) \oplus O(F_t). \qquad (6)$$

FIGURE 3: Direct connection multi-feature method.

where function $C()$ denotes the use of crossover features, function $O()$ denotes one-hot encoding, $\oplus$ denotes vector splicing, s_t denotes the knowledge point ID, c_t denotes the response result of the corresponding question (1 denotes correct, 0 denotes incorrect), and F_t denotes the optimal feature subset selected by the LightGBM algorithm [17].

Furthermore, the coding results were passed into the prediction network for training based on the ideology of Qing Dynasty Neo-Confucianism, which was calculated as follows:

$$z_t = E(x_t) = \sigma(Wx_t + b),$$
$$x_t' = D(z_t) = \sigma(Wx_t + b).$$
$$(7)$$

where x_t is the same as (6), function $E()$ denotes the encoding operation, and function $D()$ denotes the decoding operation. z_t denotes the learned latent variable, and the latent variable can be used as the input data [18].

3.2. Depth Prediction Model. The S-GRU-R is modeled based on the stacked GRU residual network, which is calculated as follows:

$$h_{1,t} = f_{gru-1}(h_{1,1-t}, z_t),$$
$$h_{2,t} = f_{gru-2}(h_{2,1-t}, h_{1,t}).$$
$$(8)$$

$$k_t == \sigma(W_{kh}(h_{2,t} \oplus z_t) + b_k).$$
$$(9)$$

where z_t is the latent variable obtained by cross-coding and one-hot coding the student responses with the optimal subset of features, and then compressing them by the self-encoder, the dimensionality of which can be set by oneself [19]. If the multifeature coding method or multifeature cross-coding method is used, z_t is replaced by x_t in (9).

3.3. Model Optimization Function. Finally, the model is optimized with the following equation:

$$L = -\sum_t (a_t \log k_{t+1}(q_t) + (1 - a_t)\log(1 - k_{t+1}(q_t)))$$
$$- \sum_t (x_t \log x_t' + (1 - x_t)\log(1 - x_t')).$$
$$(10)$$

The whole formula is divided into two parts, the first part is the optimization function of the SGRUR model network, and the second part is the optimization function of the self-encoder, which also uses the cross-entropy loss function. x' is the reconstructed data generated by the self-encoder [20].

In conclusion, this paper presents an improved knowledge-tracking model, which is expected to provide technical support for the simulation and learning of technology in the practical mindset of Qing dynasty Neo-Confucianism. However, the model performance is still subject to further experimental validation.

4. Discussion and Results

In order to further validate the performance of the proposed model, experimental analysis of the performance of different models is carried out in this paper separately. In this experiment, LightGBM is used as a comparison experiment, and SGRUR@1, SGRUR@2, and SGRUR@3 are set as ablation experiments. The Riiid dataset is divided 4:1 into training and test sets. The results are shown in Figure 4.

Another major task of knowledge tracking is to track students' knowledge acquisition levels. Figure 5 shows a visualization of the predictions from the SGRUR@MECF model for a randomly selected sample of data from the Riiid validation set.

Finally, we conducted a three-store simulation of practical thinking in Qing dynasty Neo-Confucianism using a deep learning model and found that the improved model can dynamically simulate practical thinking patterns at more nodes, and the results are shown in Figures 6 and 7.

In conclusion, the knowledge tracking model proposed in this paper has obvious advantages over previous models both in terms of simulation performance and learning feedback mechanism.
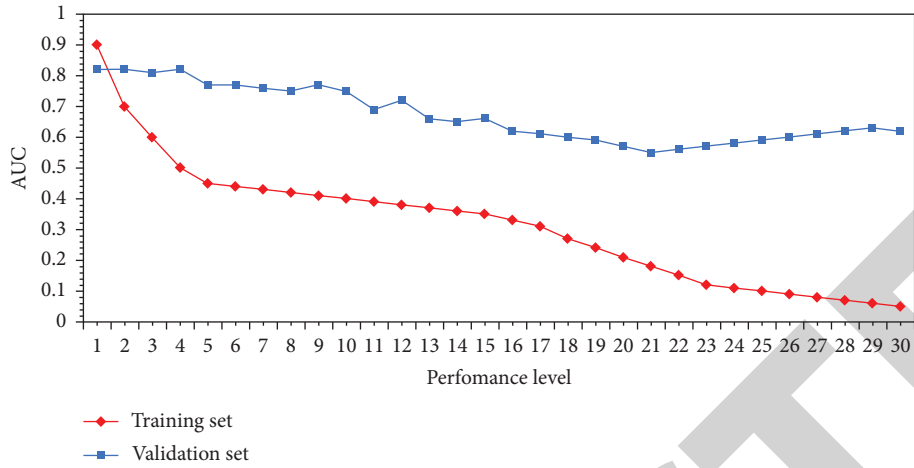
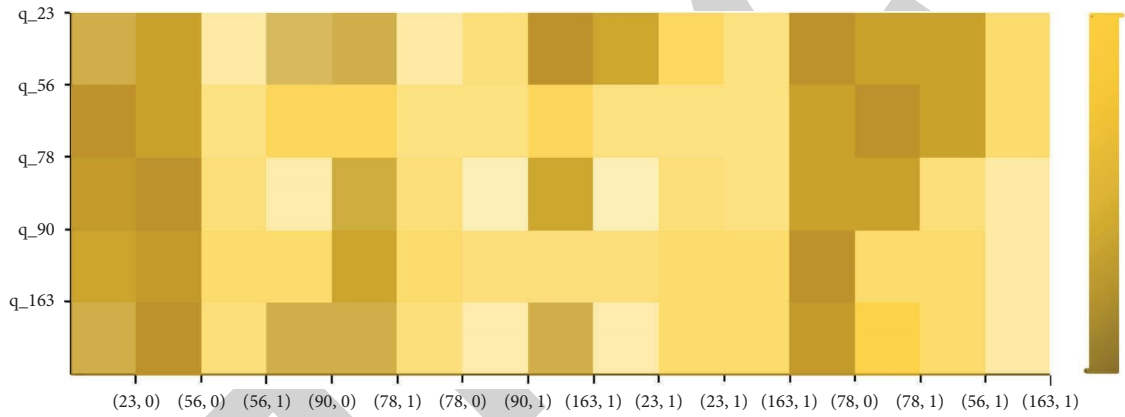Figure 4: AUC values in different performance level.

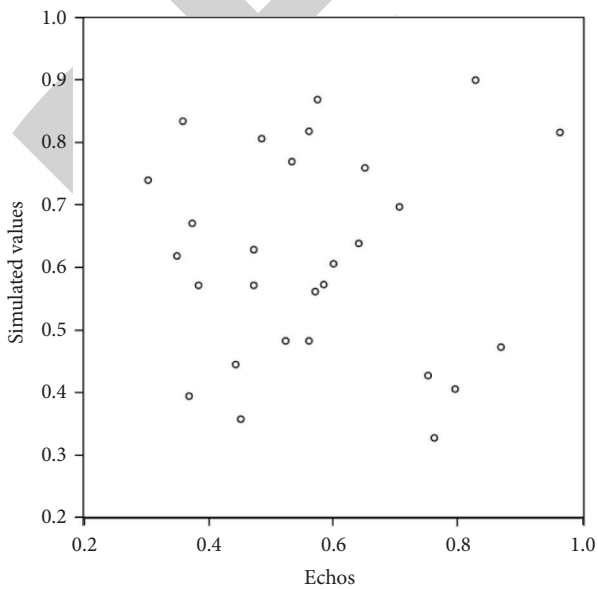Figure 5: Visualization of knowledge level tracking results.
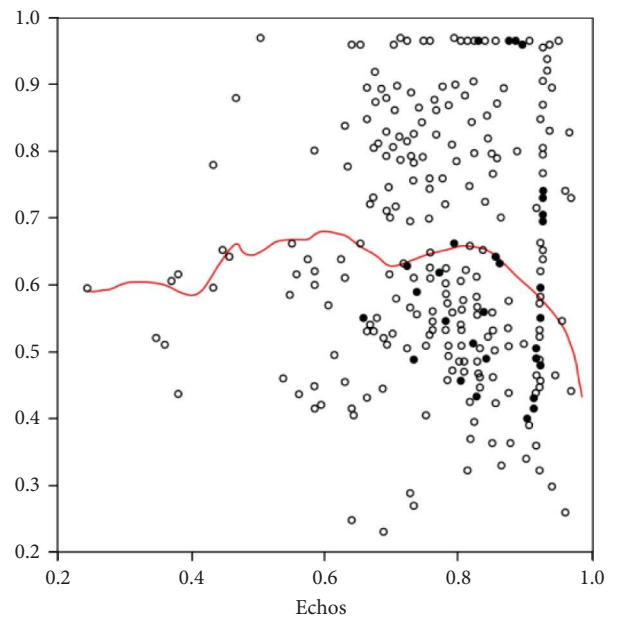

Figure 6: Traditional model.

Figure 7: Improved model.

5. Conclusion

The scholarship of the Qing dynasty was dominated by two trends: on the one hand, based on the historical lessons of the fall of the Ming dynasty, the scholars put forward a reckoning and criticism of Wang's school and its last stream; on the other hand, Cheng-Zhu Neo-Confucianism, which had been marginalized in the mid-Ming dynasty, was revived in the early Qing dynasty, showing an evolutionary trend of both breaking and establishing. In response to the problems of the times, the Neo-Confucians revived Zhuzi scholarship as a weapon of thought and attacked Yangming scholarship comprehensively. The political practice of Neo-Confucianism in the Qing dynasty had a great impact on the governance of the Qing dynasty, and also on the way of thinking of later generations, constituting a value oriented to practical thinking. However, along with the development of technology, traditional Qing dynasty Neo-Confucianism was gradually discarded and became part of history, rather than being known to the general public. The emergence of deep learning technology has helped technology intervene in the practical thinking of Qing dynasty Neo-Confucianism. In this paper, we extract the practical thinking patterns of Qing Dynasty Neo-Confucianism through deep learning algorithms and propose an improved knowledge tracking model to provide technical support for learners on how to learn the practical thinking of Qing Dynasty Neo-Confucianism.

In conclusion, the findings of this paper are not only valuable in refining the practical thinking of Qing dynasty Neo-Confucianism but also contribute to the learning and promotion of the practical way of thinking of Qing dynasty Neo-Confucianism and provide an important channel for contemporary people to learn and understand the practical way of thinking. Importantly, the findings of this paper provide a potential technical path for the integration of technology and knowledge.

However, it needs to be clarified that the extent to which the algorithm employed in this paper can extract Neo-Confucian practical thinking needs to be further verified. In addition, the improved knowledge-tracking model employed in this paper, although showing good performance on different datasets, is yet to be followed by further expansion of the experimental sample to ensure the robustness of the results.

Data Availability

The dataset can be accessed from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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