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*Research Article*

# Fuzzy Comprehensive Evaluation Model of Project Investment Risk Based on Computer Vision Technology

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With the development of the economy and real-time embedded systems and the progress of science and technology, people's economic income forms have undergone tremendous changes, and the concept of financial management has become clearer in people's property income arrangements. Project investment is one of the most popular financial management methods in the era of big data. Both large enterprise groups and individual petty bourgeoisie groups have begun to pay attention to the risks and benefits brought by the new financial management method of project investment. This paper's goal is to develop a fuzzy comprehensive evaluation (FCE) model for project investment risk based on computer vision technology and explore the application of computer vision technology in project investment risk evaluation. This article first uses a real-time embedded system to understand the basic process of project investment and select 10 investment experts for risk assessment, risks, and causes of the risks through literature research and case analysis. Then, this paper establishes a model of fuzzy comprehensive evaluation of project investment risk through computer vision technology, real-time embedded systems, and neural network models in big data and artificial intelligence technology to realize the analysis and prediction of project investment risk. The fuzzy comprehensive evaluation method and analytic hierarchy process (AHP) are used in this evaluation model to evaluate and forecast project investment risks. In addition, this paper also trains and tests the risk evaluation model of this research through the support vector machine classification algorithm, the real-time embedded system, and the average random consistency index. The research shows that the fuzzy comprehensive evaluation model of this study has higher accuracy for project investment risk evaluation than other risk evaluation methods. For example, for the investment risk of chemical fiber projects, this research model evaluated the factors such as organization, management, technology, and economy and found that the risks were all higher than 21.36%, which concluded that the overall investment risk of chemical fiber projects was relatively high.

## 1. Introduction

*1.1. Background and Significance.* Risk evaluation is an important prerequisite and necessary guarantee for project investment research. Currently, the most popular investment projects include high-quality green food projects, safe meat food production, nursing homes for the elderly, multifunctional cinemas, and various financial bonds [1]. However, for most ordinary salary groups, effective communication protocol analysis and design and project investment are mysterious and remote. Limited salary income and unfamiliarity with project investment make these people discouraged from investing in projects that symbolize high risks and high returns. Therefore, research on risk evaluation methods for project investment is of great significance. According to different salary income groups, the meaning of project investment risks is different, and different groups have different tolerance and acceptance of investment risks [2, 3]. Any project from being proposed to formal development to operation and maintenance is full of various uncontrollable factors, which mainly include natural disasters, changes in national policies, and unexpected accidents, which may cause the project to fail to achieve the final expected results or benefits, which also leads to investors who invest in these projects. Interests may not grow or even be damaged, which is the main source of risk for project investment [4, 5]. The development and operation of the project are a continuous process, so the risk evaluation of the project is also a dynamic and instant process, so as to help investors accurately and timely understand the risks of the project, so as to obtain greater benefits or encounter a crisis in the project stop loss in time. Computer vision technology is a technology that computer simulates human visual process and has the ability to feel the environment and human visual function. Traditional project investment risk evaluation is mostly based on a large amount of data analysis and related project investment experience to evaluate risks and returns. Although this can generally get a good risk evaluation result, but for natural disasters, policy changes, accidents, and other random accidents, the risks caused by uncontrollable factors often cannot be accurately evaluated and forecasted in time [6]. Computer vision technology can make up for this shortcoming, real-time embedded system, and has important research value for project investment risk evaluation.

*1.2. Related Research at Home and Abroad.* In terms of project investment risk evaluation methods, related practitioners and authoritative experts have conducted a lot of research as early as the birth of the financial management form of project investment. One of the most famous is stock trading. In the 1990s, Wall Street in the United States had set off several stock trading storms. In China, there are also many research results on the evaluation methods of project investment risks. For example, Chao et al. combined modern intelligent transportation projects and related risk assessment and management results, and through expert analysis and fuzzy analytic hierarchy process, they established a risk identification and evaluation index system [7]. This indicator system can scientifically identify and evaluate the risks in the project and take corresponding countermeasures. The only drawback is that it is not widely used because of low acceptance by the masses. Regarding the relatively tense SCP situation in a gas field in southwest China, Zeng et al. proposed a fuzzy integrated evaluation model for SCP risk evaluation. The model uses the Delphi method to determine the index weights and establishes the membership matrix based on trapezoidal distribution membership functions and gas field test data. This evaluation model is then used to derive the risk values of the 27 SCP wells in the XX gas field and the risk degree [8]. However, this method does not incorporate smart sensors for real-time monitoring, and the research is still in experimentation and has not been applied. Wang and Niu evaluated wind power projects through AHP and FCE method to find out the actual situation and predict the deviation between the target and the first-class level. This method reflects the relationship between the two by ANP and weakens the error caused by independent calculation, which more perfectly solves the shortcomings of point estimation [9]. Su et al. adopted the comprehensive evaluation method of debris flow risk based on fuzzy inference to establish a comprehensive evaluation model of debris flow risk. This model provides a debris flow risk evaluation index system for describing various influencing factors of debris flow risk in hydropower projects [10]. Unfortunately, due to the uncertainty of debris flow in hydropower projects, the risk assessment model still has considerable errors.

For the evaluation of project investment risk, this article adopts fuzzy comprehensive evaluation method combined with computer vision technology in the era of big data. The fuzzy integrated evaluation method is often used in various risk assessments and value assessments. Jane, a foreign scholar, once introduced risk analysis, network analysis, and gray fuzzy theory to the uncertainty and complexity of large-scale engineering projects [11]. Experiments prove that the method is scientific and effective, but the accuracy of the evaluation results is not high. Voorbis studied the investment information of the Canadian government's national infrastructure projects and found that even though the Canadian government increased national infrastructure spending by 11% from 2015 to 2017 and launched the Canadian Infrastructure Bank to attract private sector project funds, but private investment fell by 18% during the same period [12]. This is mainly due to the private investment risks brought by the uncertainty in the project supervision environment, especially oil and gas pipeline projects. James and Vaaler indicated that research in management and related fields is based on the assumption that state ownership of a business increases the risk to private coinvestors. He says the state is not in control but has more equity as well as ownership, which can help the state maintain favorable initial investment project terms for private coinvestors, but likewise the state's ability to intervene in project management under the same initial terms also takes a hit [13]. However, this study did not propose strong measures for this risk assessment and prediction. Frank believes that the management of risk behavior, the consideration of utility, and the tendency to accept certain risks belong to a wide range of behavior and cognitive decision-making. He presents a view of the probability of risk occurrence and the relationship between risk occurrences based on a case study approach [14]. The results show that the linear relationship between the "probability" of the risk and the "influence" that produces "value-at-risk" may not be "considered" to be correct, and this relationship may actually be affected by the index.

*1.3. Innovations in This Article.* This paper proposes a fuzzy comprehensive evaluation model combined with real-time embedded system and computer vision technology to evaluate the project investment risk, and there may be complex factors such as changes in national policies, weekly transfer of investment funds, and increased risks and costs of investment projects. Based on the diverse types of project investment and the complex factors that cause project investment risks, itt is possible to start from the content analysis and evaluation principles of the present-day balanced evaluation of project investment risk so as to be able to create a three-level project investment risk evaluation index system and give evaluation by the fuzzy comprehensive evaluation method [15, 16]. Through the quantification process, scientific evaluation of the investment risks of existing projects is carried out to provide reference evaluation, coping strategies, and control measures for the investment risks of the majority of project investors and large investment companies to support the development of various investment projects [17, 18]. The article combines the advantages of the traditional AHP and the FCE method; the advantages are that the investment risk is relatively small; reasonable reference can be provided to investors and early warning of investment risk can be carried out. Then, it evaluates the risk of project investment based on the sources of each risk factor and real-time embedded system and finally sets the risk level of the investment project through the principle of maximum membership. The results finally showed that this method is more accurate than other methods.

## 2. Fuzzy Comprehensive Evaluation Model of Project Investment Risk

*2.1. Establishing a Fuzzy Evaluation Index System for Project Investment Risks.* Through literature research and relevant project investment risk evaluation cases, the article combines the theoretical ideas of the FCE method and AHP, thus deriving a FCE model of project investment risk based on computer vision technology. The FCE comprehensive evaluation method is a widely used method in FCE mathematics. When evaluating a certain transaction, we often encounter such problems. Because the evaluation transaction is determined by many factors, we need to evaluate each factor. Due to the different risk factors and sources of different projects, this article categorizes the risk factors of most projects, which are mainly divided into policy factors, economic factors, management factors, technical factors, organizational factors, operational factors, etc. These factors can also be subdivided into various risk factors [19]. According to the abovementioned risk factor indicators and the principle of AHP, a project risk evaluation hierarchy model can be established, which is mainly divided into target layer, criterion layer, and method layer. The criterion level is the risk factor of each project, which can be divided into multiple criterion levels according to the importance of the index, the target level is the project information to be invested, and the method level is the method for risk evaluation of the target project.

Based on the idea of the FCE method, it is necessary to determine the relevant evaluation index system before establishing the risk evaluation model. As shown in formula (1), this article begins by establishing the risk factor index set $I$ and the secondary risk index set $I_j$ under the set $I$.

$$\begin{cases} I = \left\{i_1, i_2, \dots i_m \middle| m = 6\right\}, \\ I_j = \left\{i_{j1}, i_{j2}, \dots i_{jm} \middle| j = 1, \dots, 6\right\}. \end{cases} \tag{1}$$

In the above formula, $I_{\mathrm{jk}}$ represents $m$ the second layer risk under index $j$, the first level of risk indices. The first-level risk index mainly includes politics, economy, management, organization, technology, and operation. Therefore, the number of first-level indicators selected in this paper is 6. According to the abovementioned analysis, the index weight set $W$ is established.

$$\begin{cases} W = \left\{w_1, w_2 \dots w_n \middle| n = 6\right\}, \sum_{i=1}^{n} w_i = 1, \\ W_i = \left\{w_{i1}, w_{i2}, \dots w_{\mathrm{in}} \middle| i = 1, \dots, 6\right\}, \sum_{j=1}^{n} w_{\mathrm{ij}} = 1. \end{cases} \tag{2}$$

As shown in formula (2), the most important step of the project risk evaluation model is determination and calculation of weights. This article is based on the hierarchical analysis method and the entropy value method so as to derive the weights of each risk indicator [20]. Similar to the risk indicator set, weight indicator set $W_{ij}$ represents the secondary risk indicator with weight $j$ and the primary risk indicator with weight $i$. In addition, it is also necessary to verify whether the determined index meets the sum of the weights of all indices as 1. For the weight group is determined after, it is the calculation of index rating set $E$ and member analysis sets $M$.

$$\begin{cases} E = \{e_1, e_2, e_3, e_4, e_5\}, \\ M = \{1, 3, 5, 7, 9\}. \end{cases} \tag{3}$$

As shown in formula (3), the risk level expressed by each element in the indicator evaluation set is, in descending order, low risk, medium-low risk, medium-high risk, and and risk. Also, the membership degree set corresponding to the elements of these evaluation sets is $M$.

*2.2. Constructing a Fuzzy Comprehensive Evaluation Model of Project Investment Risk.* The diversity of project investment types and the complexity of risk factors determine the difficulty of using a single standardized metric to assess its investment risk. This paper proposes a fuzzy, comprehensive evaluation method of project investment risk based on computer vision technology. First, the project investment risk evaluation is decomposed into multiple indicators; after that, by analyzing linear algebra such as hierarchical processes and matrix operations, the weights of each level of risk indicators can be derived, and then the importance of each risk factor indicator for different levels of project investment can be determined. Finally, we can know the subjective and objective weights of risk factor indicators for each project investment type. Through the calculation of weights, it is transformed into a set of corresponding evaluation indicators. The overall risk level of the project investment is then analyzed based on the principle of degree of membership. The analytic hierarchy process is a systematic, qualitative, and quantitative analysis method, which is applied in many evaluation and judgment models. It combines subjective judgment and objective evaluation to arrive at the final decision result, thereby simplifying complex decision-making issues.

In this paper, the priority of each level element in the upper level is obtained by using the vector calculation method of solving the characteristic root of the matrix, and finally, the ultimate weight of the total target is obtained by using the method of weighting and summation. The purpose of evaluating the weight of project risk factors is based on a specific, standardized, and quantified assessment value of the impact of different project risk factors and then determining the types of project investment risk factors with high, medium, and low risks. Based on the theoretical basis of the AHP, the project information that investors intend to invest in is viewed as target level A, and the factors that affect investment risks include policy risks, economic risks, management risks, technical risks, organizational risks, and operational risks. We take these factors that affect project investment risk assessment as the basic assessment criterion level B. The project investment risk level is evaluated by the fuzzy comprehensive evaluation method as plan level C, and then the evaluation model is obtained. After establishing a complete evaluation index system, the corresponding fuzzy judgment matrix can be established. After summarizing and analyzing the project information through the neural network model, scoring the elements of each criterion layer and index layer, the fuzzy judgment matrix $J$ of the first-level risk factor index can be constructed as follows:

$$J = \begin{bmatrix} j_{11} & j_{12} & \cdots & j_{1n} \\ j_{21} & j_{22} & \cdots & j_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ j_{m1} & j_{m2} & \cdots & j_{\text{mn}} \end{bmatrix}. \tag{4}$$

As shown in formula (4), $m$ represents the number of first-level risk factor indicators, $n$ represents the number of scores of the corresponding indicators, and $j_{\text{mn}}$ represents the percentage of the number of evaluation times that have obtained the $n$-item score for the risk level of the $m$-th indicator factor in the project to the total number of project risk evaluations. According to the judgment matrix of the first-level risk index, the judgment matrix of the second-level risk factor can also be established, and the subordinate set element value $A_i$ of each risk index for the evaluation set $E$ can be obtained by calculation as follows:

$$A_i = W \cdot J = \left(w_{i1}, w_{i2}, \ldots w_{\text{in}}\right) \cdot \begin{bmatrix} j_{11} & j_{12} & \cdots & j_{1n} \\ j_{21} & j_{22} & \cdots & j_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ j_{m1} & j_{m2} & \cdots & j_{mn} \end{bmatrix}. \tag{5}$$

As shown in formula (5), $A_i$ indicates fuzzy comprehensive assessment score of the first-level risk factor index, where $i = 1, \ldots, 6$; according to the above calculation, member vector $A$ of the corresponding level 1 risk factors can be obtained, while the second-level risk factor index can be further calculated. The fuzzy comprehensive evaluation set is $B$.

$$\begin{cases} A = \left(A_1, A_2, \ldots, A_n\right)^T, n = 6, \\ B = W \cdot A = \left(w_1, \ldots, w_n\right) \cdot \left(A_1, \ldots, A_n\right)^T = \left(b_1, b_2, \ldots, b_n\right). \end{cases} \tag{6}$$

*2.3. Establishing the Project Investment Risk Judgment Matrix and Calculating the Weight.* For the hierarchical structure model of fuzzy comprehensive evaluation of project investment risk based on computer vision technology, the degree of importance of the influencing factors for each evaluation tier in the model is compared with the factors corresponding to the previous layer, so that the relative importance of the influencing factors in each layer can be known. In this article, the judgment matrix is used to give the determination. This type of evaluation model is used to better compare the importance of each element in the standard and target layers. In the article, the importance of each factor in the standard layer is used as a scale from 1 to 9. The values of the elements in the matrix are written by the given meanings, and thus the judgment matrix is obtained. Also, in the importance evaluation scale, the odd numbered levels from 1 to 9, i.e., 1, 3, 5, 7, and 9, it represents the higher level of importance.

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{\text{nn}} \end{bmatrix}. \tag{7}$$

As shown in equation (7), formula $A$ indicates the importance judgment value between two risk factor indicators.

Here, $a_{\text{ij}}$ represents the judgment value of the importance of the project, that is, risk element $a_i$ to risk element $a_j$ after mutual comparison. It should be noted that among all elements in the abovementioned judgment matrix, the standard layer importance level evaluation matrix is on the left, $M_i$ denotes the product of the elements of the rows in the significance measurement matrix, $\varpi_i$ denotes the square root of every element in $M_i$ in matrix order, and then $\omega_i$ denotes the worth of every element in $\varpi_i$, which is the ratio of the sum of all elements. $M_i$ of each row of the matrix of judgments $A$ is shown in the following equation:

$$M_i = \prod_{j=1}^{n} b_{\text{ij}}, i = 1, \ldots, 6. \tag{8}$$

Calculation of root values $\varpi_i$ of every row in the target matrix is shown in (9), where $n$ indicates determining the order of matrices. Therefore, worth of $\omega_i$ is possible to obtain the individual elements again in the weight matrix by normalizing the target matrix.

$$\varpi_i = \sqrt[n]{M_i} = \sqrt[6]{M_i}, \omega_i = \frac{\varpi_i}{\sum_{i=1}^{n} \varpi_i} . \tag{9}$$

According to the above calculation and analysis, the product of the standard judgment matrix $A$ and the weight matrix $\omega$ can be obtained, and several parameter indices of the judgment matrix can be calculated more deeply to verify the identity of the constructed judgment matrix and determine the importance of each influencing factor. Matrix type calculation formula is shown in the following formula:

$$A \cdot W = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ \cdots \\ w_n \end{bmatrix}. \tag{10}$$

*2.4. Neural Network Prediction Analysis of Project Investment Risk Level.* In the calculation process of the judgment matrix, this paper also verified the project investment risk fuzzy comprehensive evaluation model through the calculation of the largest eigenvalue $\lambda_{\max}$ of the judgment matrix. According to the average stochastic agreement index questionnaire of the same matrix of ordinal numbers, the stochastic consistency exponent $R_I = 1.24$ of the sixth-order matrix can be obtained, and the consistency index $C_I$ and the consistency ratio $C_R$ can be further calculated based on the following:

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(A \cdot W)_i}{nW_i}. \tag{11}$$

By the principle of consistency verification, as long as the ratio of consistency is zero, it means that the judgment matrix is completely consistent. The evaluator can grasp the weights of every indicator in the evaluation index system more easily with his own tendency, by giving appropriate adjustment to its weight and finally achieving the goal of reasonable weight distribution. The formula to calculate the consistency index $C_I$ and the consistency ratio $C_R$ is shown in the following formula:

$$\begin{aligned} C_I &= \frac{\lambda_{\max} - n}{n - 1}, \\ C_R &= \frac{C_I}{R_I}. \end{aligned} \tag{12}$$

After collecting the main information of the investment project and establishing the judgment matrix, this article divides each risk indicator of the project into three levels for risk evaluation. According to the application of computer vision technology and artificial intelligence, this article selects the BP neural network (BPNN) in the artificial neural network, evaluates and analyzes the risk degree of each indicator of the project, and evaluates and predicts the overall risk level of the project. The algorithm used by the BPNN is the error backpropagation algorithm, which is the BP algorithm. The BP algorithm can be used in multilayer feed-forward neural networks and also in other fields. It is currently the most successful algorithm. For a BP neural network, suppose the set of random variables is $\{\alpha_1, \alpha_2, \ldots \alpha_\nu\}$, $\alpha_\iota$ represents a node in the network structure, and $\Phi_\nu(\alpha_t)$ represents all the parent nodes of $\alpha_\iota$. So, it can be expressed by the following formula:

$$P(\alpha_1, \alpha_2, \ldots \alpha_\nu) = \prod_{i=1}^{n} \prod \left( \alpha_\iota | \Phi_\nu(\alpha_\iota) \right). \tag{13}$$

The joint probability space state is then the product of the conditional probabilities, which are also the probabilities of each variable in a state. After understanding the neural network structure, network learning is limited to parameters. Maximum likelihood and Bayesian approaches are the most commonly used parametric learning approaches that are used in the complete model learning of the dataset. To derive the maximum likelihood function of the parameters $\alpha$ and dataset $S$ from the sample data, one first needs to determine its network model as follows:

$$\log L(\alpha|S) = \log \prod_{i=1}^{n} P\left(d_i|\alpha\right) = \sum_{i=1}^{n} \sum_{j=1}^{p_i} \sum_{k=}^{\mathrm{qi}} n_{\mathrm{ijk}} \log\left(\alpha_{\mathrm{ijk}}\right). \tag{14}$$

## 3. Experiment on Fuzzy Comprehensive Evaluation Model of Project Investment Risk

*3.1. Research Objects.* The objects of the study in this paper are the fuzzy comprehensive evaluation models based on computer vision technology for the project investment risk evaluation program. According to the fuzzy comprehensive evaluation method, for project investment, risk evaluation is carried out based on the risk factors that all investment projects need to face such as policy, economy, technology, organization, management, and operation. Under the premise of guaranteeing a certain return, investment projects with low risks are given priority for investment, and investment projects with high risks are processed later, which can provide investors with reference data on project investment risks, improve the accuracy and timeliness of project investment risk assessment, and enhance the quality of project investment consulting services. The main information collection and risk assessment of investment projects are obtained through field investigation of relevant personnel and summary analysis of expert information to obtain the initial evaluation results, and then the expert evaluation results and real-time project information are fuzzy comprehensively evaluated through the neural network model in artificial intelligence technology.

*3.2. Experimental Design.* This study collects relevant information of investment projects and evaluation methods for project investment risks through literature research, network investigation, and field investigation and proposes a fuzzy comprehensive assessment pattern based on project management risk computer vision technology. This experiment is divided into four steps. First, by collecting information and consulting professional investors about the main processes of project investment and risk evaluation methods, the evaluation model for project investment risks is formulated. Then, we select the members of the investment expert group who will voluntarily participate in the experiment. In the process of selecting the key risk factors of the project, the selected experts should have an in-depth understanding and certain practical experience of the investment project according to the different requirements of the project type, so as to ensure the reliability of the results. In addition, this article also selects survey subjects from the project-related frontline practitioners and investors who have invested in the project to conduct a questionnaire survey. Then, in accordance with the AHP and FCE models, project investment experts and related project practitioners will evaluate project risks from various risk factors and improve the rating index system. Finally, adoption of the maximum membership guidelines and neural network model, the expert's risk evaluation of each risk factor is summarized and analyzed, and a more accurate evaluation result of the overall project investment risk level and investment recommendations are given.

*3.3. Experimental Data Processing and Error Analysis.* Experimental data handling methods in this paper are mainly realized through the neural network model. The main principle is an algorithm for error backpropagation. In accordance with the functional characteristics of neural network models and the commonly used experimental data processing methods, this paper uses SPSS22.0 software to help with experimental data. Among them, the most important application of a neural network is the application of data information, which is the transfer function and error analysis function of neurons. The transfer function selected in this article is the sigmoid function, which is also the activation function of the neural network, and its mathematical model is an S-shaped curve, so it is also called the S growth curve. Its function expression is shown in the following formula:

$$f(x) = \frac{1}{1 + e^{-x}}. \tag{15}$$

When calculating data through a neural network, the initial thing to determine is the error function. There are three types of error functions in neural networks, namely, transfer error, global error, and mean-square error function. It is known from many studies that the mean square error function is a combination of the advantages of the other two types of functions, so the article chooses the mean square error function for error analysis. The calculation of the mean square error in neural networks is expressed by the following formula:

$$\mathrm{MSE} = \frac{1}{\mathrm{MN}} \sum_{i=1}^{N} \sum_{j=1}^{M} \left(\hat{y}_{\mathrm{ij}} - y_{\mathrm{ij}}\right). \tag{16}$$

## 4. Discussion on Fuzzy Comprehensive Evaluation Model of Project Investment Risk

*4.1. Investigation on the Status Quo of Project Investment Risk Evaluation.* After understanding the project investment risk evaluation method, this paper proposes a fuzzy comprehensive evaluation model of project investment risk based on computer vision technology and establishes a relatively complete risk factor evaluation index system. The first-level risk indicators mainly include policy risk, economic risk, and risk factors such as organizational risk, management risk, technical risk, and operational risk. We select 10 investment experts in this field to conduct risk assessments, as shown in Table 1. It can be seen from the table that the weight of technical risk in the project investment risk evaluation ranks first, and the sum of the 10 experts' evaluation levels of technical risk reached 81 points, indicating that the risks brought by technical factors in project investment occupy an important position.

Based on the above research, the article chooses the AHP and the fuzzy integrated evaluation methods to give the evaluation the six first-level risk indicators, and the evaluation model is improved by combining the two methods in this paper. As shown in Figure 1, the evaluation scores of the first-level indicators of these six project investment risks are all higher than the evaluation results of purely using AHP and FCE methods.

As shown in Figure 1, AHP has the highest score in the operational risk index, 4.6 points, and the lowest score is technical risk, 2.9 points; the FCE method has the highest score of 5.4 in policy risk indicators and the lowest score of 2.8 in organizational risk indicators. The IFCF method scored the highest in the operational risk index, 6.9 points, and the lowest in the organizational risk index, 5.1 points.

*4.2. Fuzzy Comprehensive Evaluation Model on the Investment of Chemical Fiber Projects.* After establishing the FCE model of project investment risk, this paper selects some specific project investment cases for risk evaluation, as shown in Figure 2. Taking the investment situation of chemical fiber projects in 2018 as an example, research shows that the investment amount of chemical fiber projects in 2018 generally showed a slow growth trend, and its year-on-year growth rate decreased to negative growth in March, and the year-on-year growth rate was relatively stable at other times.

*4.3. CR Verification of Fuzzy Comprehensive Evaluation Model of Project Investment Risk.* To validate the article's evaluation model feasibility, the article uses CR consistency verification to test the risk evaluation of the evaluation model of this research for each risk factor index. As shown in Table 2, the main test data include the largest characteristic root of judgment and proof introduced in the above-mentioned method, average random consistency index, consistency index and consistency ratio, and index weight.

Table 1: Expert evaluation results of project-level risk indicators.

| Risk factors | Investment expert | Weighted average | Full score frequency | Risk level | Sort |
|---|---|---|---|---|---|
| Policy | 10 | 6.44 | 0.61 | 68 | 5 |
| Economic | 10 | 6.83 | 0.66 | 72 | 4 |
| Organization | 10 | 2.76 | 0.35 | 49 | 6 |
| Management | 10 | 7.58 | 0.79 | 81 | 2 |
| Technology | 10 | 7.97 | 0.87 | 86 | 1 |
| Operation | 10 | 6.89 | 0.73 | 77 | 3 |

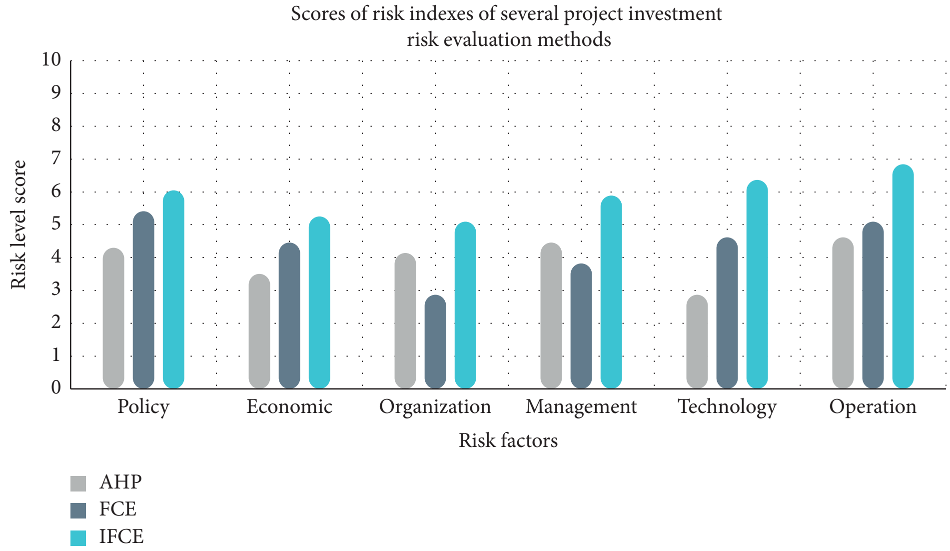

Figure 1: Scores of risk indexes of several project investment risk evaluation methods.

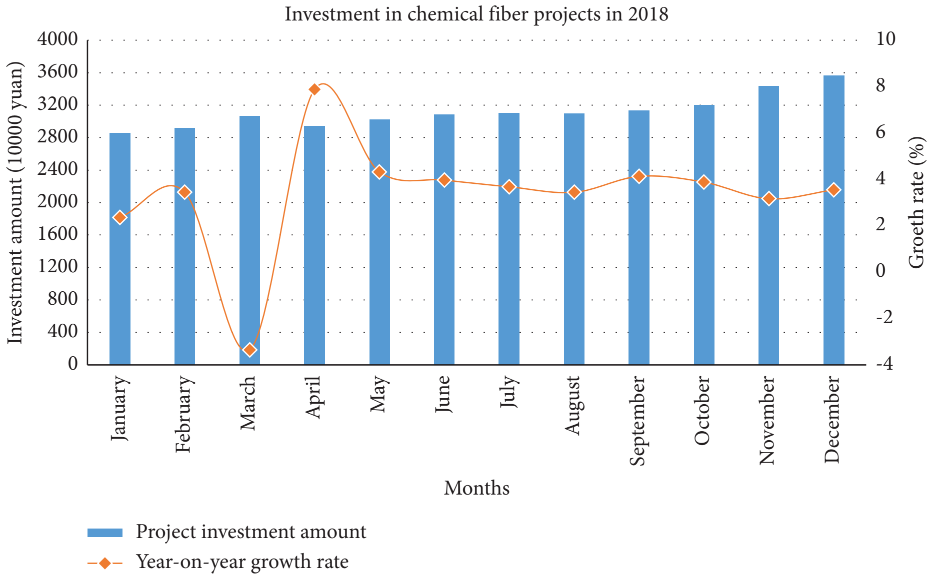

Figure 2: Investment in chemical fiber projects in 2018.

This paper also uses the established project risk fuzzy comprehensive evaluation model to carry out risk assessments on examples of oil and natural gas production-related projects. As shown in Figure 3, from 2004 to 2018, the country's natural gas production has grown steadily, but consumption is mainly divided into three types, namely, centralized production and operation, pipeline transportation and sales, and a small number of households for self-production and self-use. It can be seen from the figure that the proportion of natural gas consumption types for self-production and self-use is increasing year by year. This is also one of the important factors to be

Table 2: CR consistency index for project investment risk evaluation.

| CR statistics | A | B | C | D | E | F | Risk |
|---|---|---|---|---|---|---|---|
| $\lambda_{\max}$ | 6.141 | 6.132 | 6.113 | 6.126 | 6.075 | 6.211 | 4.233 |
| $R_I$ | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 | 1.24 |
| $C_I$ | 0.0283 | 0.0274 | 0.0255 | 0.0286 | 0.0277 | 0.0298 | 0.0035 |
| $C_R$ | 0.0228 | 0.0221 | 0.0206 | 0.0231 | 0.0223 | 0.0239 | 0.0028 |
| Weights | 0.685 | 0.664 | 0.611 | 0.697 | 0.673 | 0.712 | 1.00 |

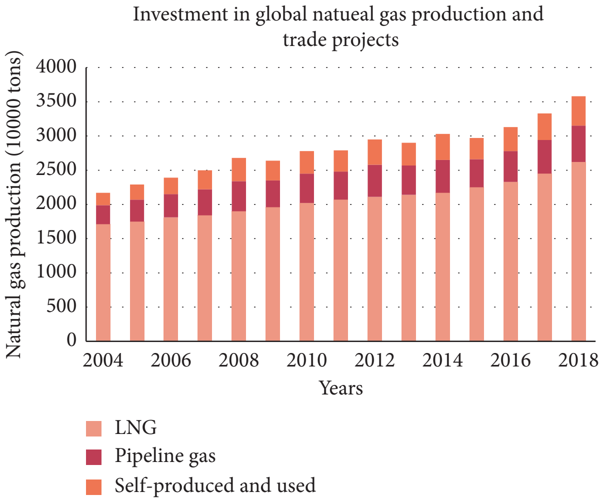

Figure 3: Investment in global natural gas production and trade projects.

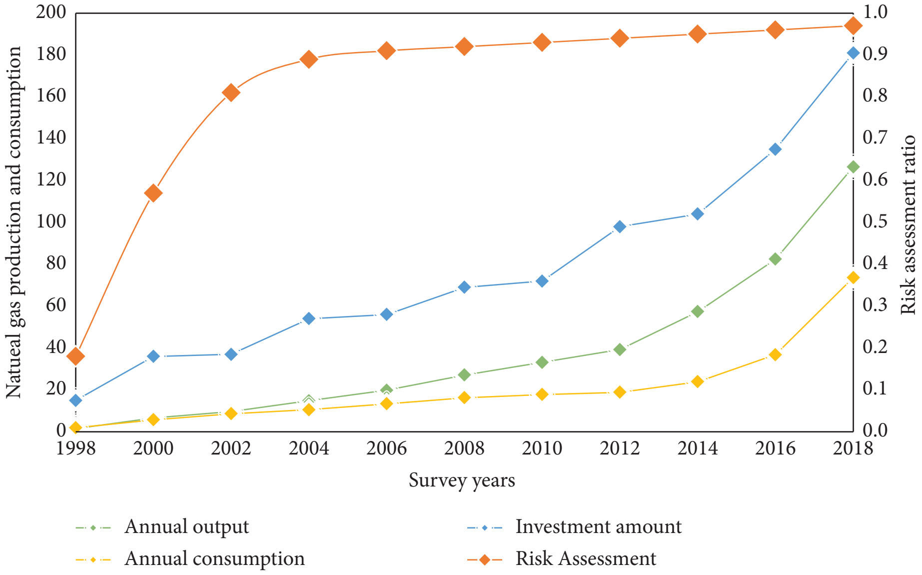

Figure 4: Natural gas project investment situation and risk evaluation.

considered in assessing the investment risk of natural gas projects.

*4.4. Investment Risk Evaluation of Natural Gas in Recent Years.* Because there are variety of project investing types, this paper selects the investment situation of natural gas projects by collecting relevant data and uses the risk evaluation model of this research to conduct risk assessment. As shown in Figure 4, since 1998, with the advancement of oil and natural gas extraction technology and the increase in people's demand for new energy, global natural gas production and consumption have been increasing steadily.

## 5. Conclusions

This article first investigates and analyzes the current development status of project investment in this field, and it was found that most investors have a very simple understanding of project investment risks and most of the investors blindly follow the trend. It is found that there are defects compared with the methods proposed in this paper, and this paper has more advantages in project investment risk evaluation performance.

Based on this, this article compares and analyzes the traditional project investment risk assessment methods for project investment risk evaluation performance and proposes a risk assessment strategy based on the computer vision technology and real-time embedded system of the FCE model of project investment risk. This approach takes advantage of the AHP and fuzzy comprehensive evaluation methods of the traditional value-at-risk evaluation. It can evaluate the risk of project investment in more depth and concretely from all aspects and provide investors with more accurate risk assessment and investment advice. The development of it is of great significance.

To investigate the evaluation performance of the FCE model of the project's investment risk, this paper uses a real-time embedded system and sets up corresponding research experiments for analysis. The main research results have the following aspects: first, this article introduces the fuzzy comprehensive evaluation method and risk evaluation principles used in project investment risk identification and the steps of evaluation implementation. Second, this article uses a neural network and a real-time embedded system to identify and analyze the risks that investors may face when participating in project investment. On the premise of ensuring a certain return on project investment, a scientific and systematic risk evaluation index system has been established to evaluate project investment risks from all aspects. Finally, according to the principle of maximum membership degree, the overall risk level of the project is given through a summary analysis of the evaluation indicators at all levels of risk factors.

Because there is not a lot of experience in project investment, the research on project investment risk evaluation in this article is still in the experimental stage. For specific investment projects, the sources of risk factors are complex and changeable and require more in-depth research. You can also try to combine other risk evaluation methods to build a more scientific and reasonable project investment risk evaluation model and get more accurate project investment risk evaluation results.

## Data Availability

The data that support the findings of this study are available from the author upon request.

## Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

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