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Retraction

Retracted: Cluster Coordination between High-speed Rail Transportation Hub Construction and Regional Economy Based on Big Data

Complexity

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] L. Zhao and Y. Jia, "Cluster Coordination between High-speed Rail Transportation Hub Construction and Regional Economy Based on Big Data," *Complexity*, vol. 2021, Article ID 6610882, 18 pages, 2021.

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Research Article

Cluster Coordination between High-speed Rail Transportation Hub Construction and Regional Economy Based on Big Data

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As people's lives get better and better, more and more people choose to travel and with that comes the demand for more transportation. For now, traditional transportation hubs can temporarily meet people's travel needs. If driven by big data concepts and methods, the various capabilities of high-speed rail transportation hubs will be sublimated, and the regional economy will be in line with the prosperity of this place. Proportionally, railway hubs are extremely attractive to the rapid growth of the regional economy. This paper takes the high-speed railway hub construction model under big data as the research object and verifies the reliability of the research model and the development of economic regions based on the high-speed railway data in recent years as reference parameters. This article selects the panel data of railway transportation and regional economy in China's provinces for 10 consecutive years from 2011 to 2020. Among them, seven indicators were selected for railway transportation: passenger volume, freight volume, passenger turnover, cargo turnover, number of railway employees, railway transportation industry fixed asset investment and construction scale, and per capita railway network density. In terms of regional economy, six indicators were selected: regional GDP, per capita GDP, per capita investment in fixed assets, per capita total retail sales of consumer goods, per capita investment in imports and exports, and the proportion of the added value of the tertiary industry in GDP. The experimental results prove that each sample is tested in pairs, the standard error level of the mean is 0.002, which is less than 0.05, and high-speed railway construction can finally achieve economic integration. By improving the development of high-speed railways, continuously shortening the distance between time and space, breaking regional trade barriers, and reducing the cost of commodity circulation, industrial interaction and coordinated development between different regions can be effectively promoted.

1. Introduction

Rapid economic growth has led to a large amount of transportation demand, and differences in travel and service requirements have gradually diversified transportation and established a complete transportation hub. This is consistent with the ideas and methods of big data. How to use big data ideas and technologies to effectively use this information to serve the construction, management, and operation of nodes has become an important issue for improving the service level of integrated transmission nodes.

The development of railway transportation abroad has existed for a long time, and the research on the relationship between railway transportation and regional economic development is relatively mature. China's railway construction is relatively late, but, with the construction and operation of railway transportation in various parts of our country, the relationship between railway transportation and the coordinated development of regional social and economic development has attracted more and more attention. There is a strong interdependence between a region and its neighbors. Therefore, the economic development of a region depends not only on its own foundation and investment but also on the development history of other regions. Li et al. pointed out that participation in high-level education and R&D has a higher impact on economic welfare. Furthermore, R&D indicators can be used as an important driving factor for evaluating economic welfare

[1]. When Wang and Loo studied the travel time of passengers, they studied the impact of high-speed railway on the time and space distance in the city network and derived the relationship between travel time and regional accessibility [2]. Pascal and Soua obtained the construction and operation of the high-speed railway through the research of the French high-speed railway TGV, which can improve regional accessibility [3].

Domestic researchers later studied the impact of high-speed railwayway construction on the local economy, but there are few studies. However, with the rapid development of China's high-speed railway construction and operation, research in this field has gradually been enriched and certain results have been achieved. With the improvement of technology and the wide application of measurement methods, scholars began to use quantitative analysis tools to quantitatively study the coordination relationship between railway transportation and regional economy. Based on the status quo of China's railway transportation and economic development, foreign theories and methods are used to conduct relevant research and analysis in different regions. Ikeda et al. used the industrial agglomeration theory of new economic geography to analyze the differences in China's regional economic development. It has been found that, since joining the World Trade Organization, the Gini coefficient where the industry is located has been declining, and the changes in regional economic differences have slowed down [4]. Han et al. used the linear weighting model and the dispersion coefficient method to quantitatively study the dynamic coordinated development level of the regional system and evaluated the effective degree of coordination and development within the regional system and between subsystems [5]. Li et al. established a dynamic model through dynamics and analyzed the relationship between transportation and economy [6].

Based on the research results at home and abroad, this paper finds that the algorithm of each method is based on different research data. This paper constructs a high-speed railway regional economic development model and studies route planning and high-speed railway integration models for big data. This paper conducts cluster analysis on three types of data and analyzes that the overall dimensionality reduction based on four weighting algorithms can effectively remove the attributes of less important research objects.

2. Cluster Coordination between High-Speed Railway Transportation Hub Construction and Regional Economy Based on Big Data

2.1. High-Speed Railway Transportation Hub, Hub Informatization, and Big Data

2.1.1. Informatization of High-Speed Railway Transportation Hub. Renewing the high-speed railway hub is very important to the management of the hub. Information management can further highlight the benefits of various transportation, high-speed railway, effective and targeted solutions for node management problems, and improving the service level of the transmission system. In terms of coordinating transportation methods, handling emergency situations, and managing transportation needs, the management of high-speed railway hubs faces many management problems [7, 8]. To create a high-speed railway hub, we must propose targeted solutions to these management problems. Currently, a large number of nodes have created node information management platforms; these platforms have made significant contributions to coordinate link management, emergency, and rapid response and guide the flow of passengers. After determining the two basic conditions, use the reachability calculation model for calculation.

2.1.2. High-Speed Railway Transportation Hub and Big Data. From the current general point of view, big data has the characteristics of large quantity, variety, and speed, which represents a huge data scale, complex and diverse data forms, and the possibility of accurate and fast processing [9, 10]. Due to specific traffic functions and design locations, high-speed railway hubs have the characteristic of generating a large amount of different and complex data at high speed. For the city's large passenger transport hub, hundreds of thousands of passengers enter the hub every day. Faced with a large number of passenger transportations and logistics, high-speed railway operators have to deal with a large amount of complex information from video surveillance systems [11]. Big data indicates higher requirements for information: more information, more complete types of information, and more effective processing methods.

2.2. Regional Economic Coordination.

First, construct the database according to the national economic census report specifications and prepare the network data report; then each census unit fills in the network report according to the nature of the unit and reports it directly, and each basic statistics bureau or department reviews the reported data and then reports it level by level. Analyze and process the final reported data, dig out the laws of economic development, discover economic development problems, and use modern information technology to make scientific predictions to form an analysis report [12, 13]. The economic census data processing process mainly includes four steps: report preparation, data collection, summary analysis, and data release.

2.2.1. Improve Regional Accessibility. Regional accessibility is reflected in the diversity of ways to reach a city. The improvement of traffic conditions has shortened the space-time distance between cities, and the frequency and spatial distance of people's travel have increased a lot compared to before. The convenient transportation environment improves the accessibility of the region and increases the attractiveness of the region. More enterprises and productivity are attracted to inject new vitality into the development of the region [14, 15]. The station has improved the city's traffic conditions and increased the radius of the city's activities and exchanges. The increase in speed and the reduction in travel distance have resulted in cross-regional work and schooling.

2.2.2. The Impact of High-Speed Railway on Regional Integration. The integrated big data center collects a large amount of data from multiple sources in the transportation industry, such as urban roads, railway transportation, land public transportation, leasing, railway passenger and freight transportation, and freight and freight Hadoop to create large data processing groups. Large amounts of traffic data are stored and processed [16, 17]. The integrated big data center is mainly divided into four databases: basic database, business database, exchange database, and theme database, used to store structured and unstructured data and, on this basis, carry out statistical analysis, web analysis, and data mining. The big data of the completed transmission node is waiting to be processed.

2.3. Method Based on Clustering Feature Summary. For the original data set that is too large to be read into memory at one time, you can first identify and summarize some of the data objects, reduce their memory usage, and complete large-scale data cluster analysis. Classical methods can be used, such as hierarchical method of balanced iterative induction clustering algorithm [18, 19]. The BIRCH clustering algorithm uses the CF tree to summarize information. CF is the main component of the node of the tree and the core of BIRCH. All the information of the cluster in the CF includes all the information needed for clustering. If you want to merge two clusters, you only need the sum of their corresponding CFs.

$$\overline{X}_0 = \frac{\sum_{i-1}^{N} \overline{x}_i}{N},$$
$$R = \left(\frac{\sum_{i-1}^{N} \left(\overline{x}_i - \overline{x}_0 \right)}{N} \right)^{1/2}, \tag{1}$$
$$D = \left(\frac{\sum_{i-1}^{N} \sum_{j-1}^{N} \left(\overline{x}_i - \overline{x}_j \right)^2}{N(N-1)} \right)^{1/2}.$$

The above information can be used to represent the information of the internal members of a cluster. The distance between clusters is used to express the degree of separation between clusters [20]. BIRCH defines the following 5 types of distance formulas between clusters. These distance formulas describe the degree of separation between clusters from different angles.

$$D_0 = \left[\left(\overline{x}_i - \overline{x}_j \right)^2 \right]^{1/2},$$
$$D_1 = \left| \overline{X}_{0_1} - \overline{X}_{0_2} \right| = \sum_{i-1}^{N} \left| \overline{X}_{0_1}^{(i)} - \overline{X}_{0_2}^{(i)} \right|,$$
$$D_2 = \left(\frac{\sum_{i-1}^{N_1} \sum_{j-N_1+1}^{N_1+N_2} \left(\overline{x}_i - \overline{x}_j \right)^2}{N_1 N_2} \right)^{1/2}, \tag{2}$$
$$D_3 = \left(\frac{\sum_{i-1}^{N_1+N_2} \sum_{j-1}^{N_1+N_2} \left(\overline{x}_i - \overline{x}_j \right)}{\left(N_1 + N_2 \right)\left(N_1 + N_2 - 1 \right)} \right)^{1/2},$$
$$D_4 = \sum_{j-N_1+1}^{N_1+N_2} \left(\overline{x}_j - \sum_{i-N_1+1}^{N_1+N_2} \frac{\overline{x}_i}{N_2} \right)^2.$$

Because CF completely retains some of the key information required for the above calculations, BIRCH can use CF to complete large-scale data clustering. For example, CF can calculate the cluster radius R, where $R = (((\mathrm{SS} - \overline{\mathrm{LSLS}}^T)/N)/N)^{1/2}$. Similarly, the diameter D and the distance between clusters $D_0 - D_4$ can be calculated using CF. It can be calculated by the six following formulas:

$$D = \left(\frac{2N(\mathrm{SS}) - 2\overline{\mathrm{LSLS}}^T}{N(N-1)} \right)^{1/2},$$
$$D_0 = \left[\left(\frac{\overline{\mathrm{LS}}_1}{N_1} - \frac{\overline{\mathrm{LS}}_2}{N_2} \right)^2 \right]^{1/2},$$
$$D_1 = \left| \sum_{i-1}^{d} \left(\frac{1}{N} \overline{\mathrm{LS}}_1^{(i)} - \frac{1}{N_2} \overline{\mathrm{LS}}_2^{(i)} \right) \right|,$$
$$D_2 = \left(\frac{N_2 \mathrm{SS}_1 - 2\overline{\mathrm{LS}}_1 \overline{\mathrm{LS}}_2^T + N_1 \mathrm{SS}_2}{N1N2} \right)^{1/2},$$
$$D_3 = \left(\frac{2\left(N_1 + N_2 \right)\left(\mathrm{SS}_1 + \mathrm{SS}_2 \right) - 2\left(\overline{\mathrm{LS}}_1 \overline{\mathrm{LS}}_1^T + \overline{\mathrm{LS}}_2 \overline{\mathrm{LS}}_2^T \right)}{\left(N_1 + N_2 \right)\left(N_1 + N_2 - 1 \right)} \right)^{1/2},$$
$$D_4 = \frac{\overline{\mathrm{LS}}_1 \overline{\mathrm{LS}}_1^T}{N_1} + \frac{\overline{\mathrm{LS}}_2 \overline{\mathrm{LS}}_2^T}{N_2} - \frac{\overline{\mathrm{LS}}_1 \overline{\mathrm{LS}}_1^T + \overline{\mathrm{LS}}_2 \overline{\mathrm{LS}}_2^T}{N_1 + N_2}. \tag{3}$$

Dice similarity coefficient calculation formula is as follows:

$$\mathrm{DICE} = \frac{2|\mathrm{SEG} \cap \mathrm{GT}|}{|\mathrm{SEG}| + |\mathrm{GT}|},$$

$$y = \alpha W y + \beta_1 X - W\beta_2 X + \varepsilon, \tag{4}$$

$$\ln g_{\mathrm{it}} = \alpha_0 + \alpha_1 du * dt + \sum_{i-1}^{N} b_j X u + \varepsilon_u.$$

SEN coefficient calculation formula is as follows:

$$\mathrm{SEN} = \frac{|\mathrm{SEG} \cap \mathrm{GT}|}{\mathrm{GT}}, \tag{5}$$

$$\theta(p, q) = \arctan\left(\frac{L(p, q+1) - L(p, q-1)}{L(p+1, q) - L(p-1, q)}\right), \tag{6}$$

$$\psi = \sum_{x-1}^{\theta} V x = \sum_{x-1}^{\theta}\left(\frac{W x}{\sum_1^x W_x} S x\right). \tag{7}$$

In the process of clustering, if you want to cluster efficiently, you need to determine what is important data and what is secondary data; important data is very important to the role of the cluster, and secondary data can be processed secondarily [21]. Keep the primary data, summarize the secondary data, and save their clustering information with appropriate statistics.

2.4. Conception of Hub Informatization Based on Big Data

2.4.1. Discover More Needs and Patterns from the Data. The high-tech data analysis technology of this node will enable managers to proactively investigate traffic demand without waiting for passengers to make requests or even solve the supply-demand relationship when problems arise. Due to its content, the integrated transportation node has different operation modes and characteristics from general transportation methods and transportation stations. Their completeness and complexity make it difficult to penetrate many node information processing methods. With the help of big data ideas and technologies, it can not only process and publish diverse, comprehensive, and complex data but also provide valuable resources. For administrators and service providers, it is undoubtedly beneficial to discover the tacit traffic demand from these information-rich resources and discover the changing mode of the mobile center [22, 23]. Mined needs and patterns can also provide targeted and personalized traffic services for functional groups and scenarios. With the help of big data, it will be possible to meet the needs of traffic service users and improve the experience of using traffic services.

2.4.2. More Accurate Warning and Faster Response. Emergency management is the most difficult part of managing an integrated transportation hub. In emergency situations, the quick response level can usually tell you the advantages and disadvantages of node management. The node information management method can help managers to be calmer and effectively deal with emergencies and can help managers to develop better evacuation plans and more effective passenger flow guidance. With the help of big data, the emergency response level of the center will be significantly improved. This is reflected not only in the effectiveness after emergence but also in effective early warning. Standard mode analysis of multiple data conditions will help establish an effective and accurate event warning mechanism. By analyzing a large amount of emergency data at historical nodes [24, 25], the emergency mode can be obtained, and then the phenomenon warning can be compared with the operation management, or the display mechanism can be further analyzed by the following method: mode to achieve event warning and quick response effect. With the help of big data processing methods, real-time monitoring can also quickly make faster and more accurate judgements about the state of the center.

2.4.3. Basis of Complex Coordinated Linkage Technology. Efficient data processing mechanism will lay the foundation for complex adjustment and link technology. Large-scale data analysis and processing methods will enable integrated transmission nodes to quickly process this data while receiving large amounts of data. The complexity of a node determines the complexity of its data structure. The data used by the management and transmission service provider must also be processed before it can be released and exchanged with the connection provider. Under normal circumstances, only simple data such as train arrivals and messages can be transmitted in real time. Slightly more complex data interactions require at least one day, even a week, or a month to be transmitted to the other party [26, 27]. At present, due to lack of timeliness, it is difficult to provide help for the current services of the node, and most of them are used to summarize experience. The mechanism for quickly processing large amounts of data can quickly improve and transmit effective information and even interact to achieve the goal of high-quality services. Within the scope of application of big data technology, better coordination and link management will be carried out.

2.5. Influence of Railway on Regional Economy

2.5.1. The Influence of Railway on the Formation and Development of China's Regional Economic Belt. China's railway development process reflects the course of China's economic development from the side. Judging from its early military and political importance or its successor economic importance, railway transportation has always played an important role and has made indelible achievements in China's economic development. It is obvious to promote the development of railway in the development of regional economy. The development of regional economy has always been closely connected with transportation, which requires strong transportation guarantee. As the main force of transportation, railway transportation has an irreplaceable status. Since the reform and opening up, railway transportation has undergone many major developments and accelerations to realize the effective circulation of human resources, logistics, and other market elements. The construction and continuous improvement of the railway network have promoted the development of China's southeast coastal areas and linked the supply of raw materials with the central and western regions. It can be understood that railway transportation is a necessary and sufficient condition for the formation of a regional economy, the first construction of railway transportation, and the subsequent formation of the regional economy. Looking at the main railway lines in China, it is not difficult to see that they connect China's central cities to develop urban economic and commercial circles and guide urban development. For example, as transportation hubs, central cities such as Shanghai and Beijing have played a role in economic radiation and have become continuous trade corridors.

2.5.2. Links between Railways and Major Economic Regions. Railway transportation has played an important role in China's economic development. Significant changes have taken place in the industrial layout of areas along the railway, and railways have become an important part of the industrial layout. After the reform and opening up, we have observed the process of China's economic development, and it is not difficult to see that important industries are concentrated in areas along the main railway lines. The development of large railways has paved the way for the establishment of economic zones, and the layout of the railway network has also contributed to the economy and has had a significant impact on development. So far, the strategic planning for the distribution of productivity along the main railways in Northeast, North China, Southeast, Northwest, and Southwest has been completed, and the development of railways has become the political guide for economic development strategies. Facts fully show that the gradual maturity of urban settlements will stimulate interregional traffic demand, and the increasing traffic demand will in turn promote the connections and exchanges between urban settlements and will also develop regional economies.

2.5.3. Influence of the Railway on the Economic Structure Adjustment of the Areas along the Route. Passenger and cargo exchange in railway transportation is an important factor in economic growth. The construction and sustainable development of the railway will inevitably have an impact on the economic structure of the regions along the route, and the subsequent economic growth along the route will also expand the total regional economy. The direction of the railway also reflects the layout of the resource flow. The resource line can promote the formation of the regional economy by promoting the development and upgrading of industry and providing appropriate materials and labor.

2.5.4. Influence of Railway on the Economic Development of Underdeveloped Areas. Railway traffic has a unique role in promoting the economy of underdeveloped areas along the line. Take a typical case in the economic development of the United States to illustrate that the development of natural resources and economic development in the western region of the United States benefited from the large-scale railroad construction in the United States in modern times, especially the rapid development of heavy industrial industries such as steel and machinery related to the railway industry. Our country's economic development has always been uneven. Since the reform and opening up, the economic gap between regions has gradually widened. Economically active areas have more human resources, modernization and economic development levels are higher, but the geographical space is smaller, and more regional space is needed; meanwhile those economically backward areas have abundant natural resources and vast geographical space but scarce economic growth point. Transportation is the main channel and important link for communication between these two types of regions, which organically connects the economically developed and economically backward regions, carries out the flow and transfer of economic factors between them, and effectively transfers capital, technology, and talents.

3. Coordination between the Construction of High-Speed Railway Transportation Hub and Regional Economy

3.1. Demand Analysis. Intelligent data analysis is based on data collection, statistics, and aggregation and uses intelligent analysis models to mine and discover census data relationships, economic development issues, economic level regional division, economic index level status, and national economy based on economic indicators development layout countermeasures and suggestions. Intelligent data analysis needs to meet the needs of effective statistics and clustering of data reports that cannot be counted by existing database technology, the need to assist database technology in order to find problems more comprehensively, so as to have a more comprehensive grasp of the overall situation, and the need to plan for the next step of economic development basic analysis work and forecast suggestions.

3.2. Database Storage System. The database storage system is the foundation of the entire system and a prerequisite for intelligent analysis of census data. This database storage system mainly includes functions such as user management, data entry and import and export, data query and summary, system navigation assistance, and system security management.

3.3. Test Subject. The intelligent data analysis system mainly completes the intelligent analysis of economic census data, and its goal is to use intelligent analysis methods and data mining related technologies to discover unknown laws in economic census data. The system tried four methods of intelligent analysis of the economic census data, fuzzy clustering, MMD algorithm, K-means algorithm, and FCM algorithm, and analyzed three types of data: economic growth, financial status, employment by industry and wages. A cluster analysis was carried out and a good conclusion was obtained. At the same time, data from railway traffic and regional economic data tables are selected for 10 consecutive years from 2011 to 2020. Among them, the railway traffic data comes from the "National Railway Statistics Abstract 2011–2020," the Ministry of Transport, and regional economic data from China's 2011–2020 statistical year, provincial and municipal statistical yearbooks, and the National Bureau of Statistics. It provides practical value that can be reported at the decision-making level and can refer to information that cannot be obtained by traditional database analysis methods and statistical methods.

3.4. Experimental Method. This paper selects the panel data of China's provincial railway traffic and regional economy for 10 consecutive years from 2011 to 2020. Among them, railway transportation selects seven indicators: passenger volume, freight volume, passenger turnover, cargo turnover, number of railway employees, railway transportation industry fixed asset investment construction scale, and per capita railway network density. In terms of regional economy, six indicators are selected: regional GDP, per capita GDP, per capita fixed asset investment, per capita retail sales of consumer goods, per capita import and export investment, and the proportion of tertiary industry added value in GDP.

3.5. Data Processing. The index selected in this article is the annual statistical data of books, which is the index data of practical value. Therefore, the trapezoidal fuzzy table distribution function is usually used to calculate the participation of each indicator. The specific formula is as follows: partially large trapezoidal distribution is as follows:

$$r(x) = \frac{x-c}{d-c}, \quad c < x < d. \tag{8}$$

Partially small trapezoidal distribution is as follows:

$$r(x) = \frac{b-x}{x-a}, \quad a < x < b. \tag{9}$$

For the ideal score value, it can usually be set as the middle value of each interval. This paper divides the evaluation grades into five grades, and the index data after normalization processing all fall into the [0-1] interval.

There are many ways of data standard processing, but different data standardization methods will have a certain impact on the evaluation results of the system. For the positive index standardization method,

$$y_{ij} = \frac{x_{ij} - \min\left(x_{ij}\right)}{\max\left(x_{ij}\right) - \min\left(x_{ij}\right)}. \tag{10}$$

For negative index standardization methods,

$$y_{ij} = \frac{\min\left(x_{ij}\right) - x_{ij}}{\max\left(x_{ij}\right) - \min\left(x_{ij}\right)}. \tag{11}$$

After standardizing the data, using the principal component analysis of nonlinear logarithmic centering, the processing steps of logarithmic transformation and row vector centering are

$$z_{ij} = \ln y_{ij} - \sum_{i-1}^{m} \frac{\ln y_{ij}}{m}. \tag{12}$$

3.6. Statistical Methods. SPSS 23.0 software was used for data processing, and the count data was expressed as a percentage (%), k is the amount of data in this experiment, σ^2 is the variance of all survey results, and $P < 0.05$ indicates that the difference is statistically significant. The formula for calculating reliability is shown in equation (7).

$$a = \frac{k}{k-1}\left(1 - \frac{\sum \sigma_i^2}{\sigma^2}\right). \tag{13}$$

4. Coordination between the Construction of High-Speed Railway Transportation Hub and Regional Economy

4.1. Evaluation Index System Based on Index Reliability Testing. Reliability refers to the stability and reliability of the questionnaire. This article adopts the α coefficient method created by L. J. Cronbach. The α coefficient can be obtained by Reliability Analysis in SPSS software. It is generally believed that the α coefficient above 0.8 indicates that the effect of index setting is very good, and that above 0.7 is also acceptable.

This experiment can be used to perform cluster analysis on three types of data: economic growth, financial status, employment status by region and wages ($\alpha > 0.7$). As shown in Table 1, the economic growth under the fuzzy clustering model is 0.8427. There are no absolute pros and cons between analyses, not to say that the more complex the model, the better the prediction performance. Within an acceptable range, the preconditions of the experiment are met, which provides a basis for subsequent experimental analysis.

4.2. Three Indicators by Different Intelligent Analysis Methods. As shown in Figure 1 and Table 2, economic attributes are mainly divided into three subitems: economic growth, financial status, and employment of personnel by industry and wages by region. There are 79 dimensions in total. This time, 4 algorithms are used for overall dimension reduction, which overcome the shortcomings of inaccurate clustering results of different densities by general algorithms.

It can be seen from Figure 2 and Table 3 that the overall dimensionality reduction based on the four weighted algorithms can effectively remove the attributes of the research object with less significance. It is similar to the principal component analysis and the multiattribute projection pursuit method, but the effect is better after clustering.

As shown in Table 4, the result is more accurate. Here, choose the intelligent analysis of four methods: fuzzy clustering, MMD algorithm, K-means algorithm, and FCM algorithm, and perform cluster analysis on the three types of

Table 1: Summary table of reliability test results.

Intelligent analysis	Type of data	Alpha coefficient (α)
Fuzzy clustering	Economic growth	0.8427
MMD algorithm		0.7652
K-means algorithm	Financial situation	0.7372
FCM algorithm	Personnel employment and personnel salary by industry by region	0.7592

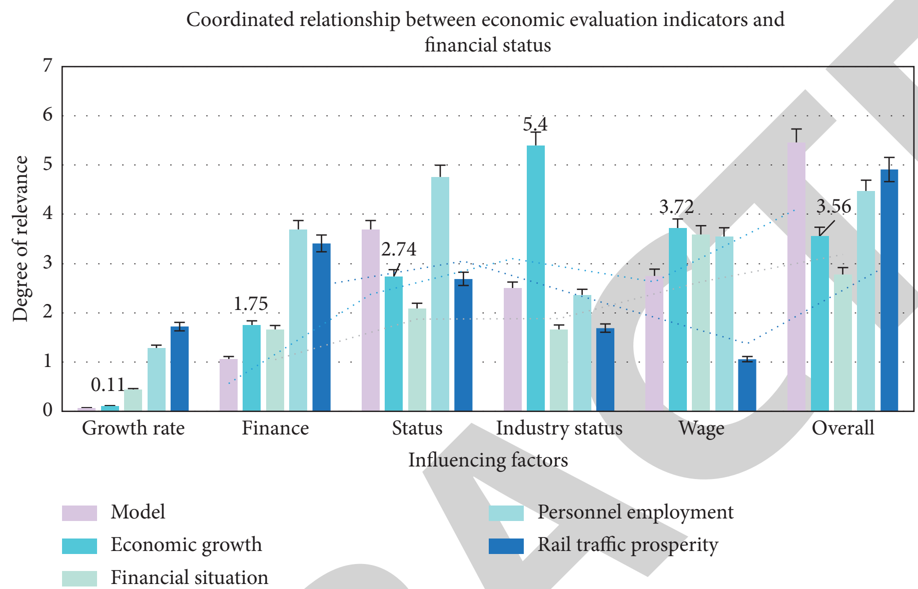

Figure 1: Coordinated relationship between economic evaluation indicators and financial status.

Table 2: The construction and analysis of the high-speed railway economic hub.

Item	Model	Economic growth	Financial situation	Personnel employment	Rail traffic prosperity
Growth rate	0.07	0.11	0.44	1.28	1.72
Finance	1.06	1.75	1.66	3.69	3.41
Status	3.69	2.74	2.09	4.76	2.69
Industry status	2.5	5.4	1.67	2.36	1.69
Wage	2.75	3.72	3.59	3.55	1.06
Overall	5.46	3.56	2.78	4.47	4.91

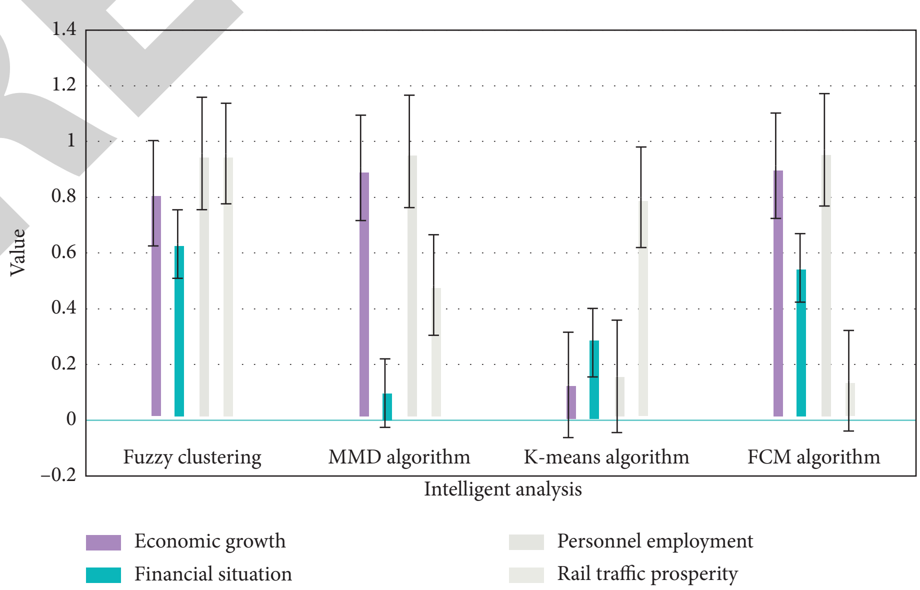

Figure 2: Analysis diagram of three indicators by different intelligent analysis methods.

Table 3: Three indicators by different intelligent analysis methods.

Model	Economic growth	Financial situation	Personnel employment	Rail traffic prosperity
Fuzzy clustering	0.8147	0.6324	0.9575	0.9572
MMD algorithm	0.9058	0.0975	0.9649	0.4854
K-means	0.127	0.2785	0.1576	0.8003
FCM algorithm	0.9134	0.5469	0.9706	0.1419

Table 4: The growth level of the regional economy and the development of the railway hub.

Model	Economic growth	Financial situation	Personnel employment	Rail traffic prosperity
Fuzzy clustering	0.8147	0.6324	0.9575	0.9572
MMD algorithm	0.9058	0.0975	0.9649	0.4854
K-means	0.127	0.2785	0.1576	0.8003
FCM algorithm	0.9134	0.5469	0.9706	0.1419

data of economic growth, financial status, and regional employment and wages. It proves that the growth level of the regional economy and the development of the railway hub have a mutually promoting effect.

As shown in Figure 3 and Table 5, the scope of the overall planning of innovation resources at the city level has been expanded to form a hub innovation circle within 10 minutes of a comprehensive transportation hub site. The change in the spatial form of the innovation block at the block level has formed a TOD innovation block within an 800 m walk-in radius of a high-intensity development area. The vertical concentration of innovative functions at the architectural level is a comprehensive innovation core that uses the complex as a carrier to gather innovative elements.

4.3. Evaluation Model of System Coupling Coordination and Analysis of Results

4.3.1. Judgement Analysis of the Correlation of Evaluation Indicators. As shown in Table 6 and Figure 4, before further analysis of the data, first analyze the correlation of evaluation indicators and the partial correlation between variables. The correlation coefficient matrix and the corresponding statistical value are obtained through 4 algorithms. Judging whether the evaluation index is suitable for principal component analysis according to the value, KMO greater than 0.9 indicates very suitable; KMO less than or equal to 0.9 and greater than 0.8 indicates appropriate; KMO less than or equal to 0.8 and greater than 0.7 indicates appropriate; KMO less than or equal to 0.7 and greater than 0.6 indicates barely appropriate; KMO less than or equal to 0.6 and greater than 0.5 means inappropriate; KMO less than 0.5 means inappropriate.

As shown in Figure 5, the existence of high-speed railway and air service time windows will have a certain impact on the decision-making of multimodal transportation routes for fresh products. When the total cost is the goal, the “high-speed railway + highway” transportation combination method can be selected in consideration of the node time window; in addition, compared with the optimal route without the node time window, the existence of the time window of the transportation mode at the node is to a certain extent. It increases the cost of time value, but it is more realistic and reasonable than the idealized scenario without time window in previous studies. Multimodal transport operators can choose appropriate routes and transportation methods according to the situation.

The result is shown in Figure 6 and Table 7; at the same time, each sample is tested on the selected samples, and the mean, standard deviation, standard error of the mean, and other data are obtained, as shown in Table 2.

It can be seen from Table 8 that, at the same time each sample is tested in pairs, the standard error level of the mean is 0.04, which is greater than 0.05, indicating that the correlation matrix of the evaluation indicators of the railway transportation system and the regional economic system is suitable for principal component analysis.

It can be seen from Figure 7 and Table 9 that the construction of high-speed railways is an important means to accelerate regional economic development. High-speed railways can not only adjust the industrial structure and improve the market structure but also deepen interregional connections, increase the employment rate, and inject the regional economy vitality.

4.3.2. Railway Traffic Index Data Based on MMD Algorithm. As shown in Figure 8 and Table 10, in terms of railway transportation, we select passenger volume, freight volume, passenger turnover, cargo turnover, railway employment, railway transportation industry fixed asset investment and construction scale, and per capita railway network density. These seven indicators mainly adjust the maximum number of iterations of the model, the learning rate, and the maximum depth of the tree. Each iteration will produce a weak learner. If the number of weak learners is too small, it is easy to underfit, and if there are too many, it is easy to overfit.

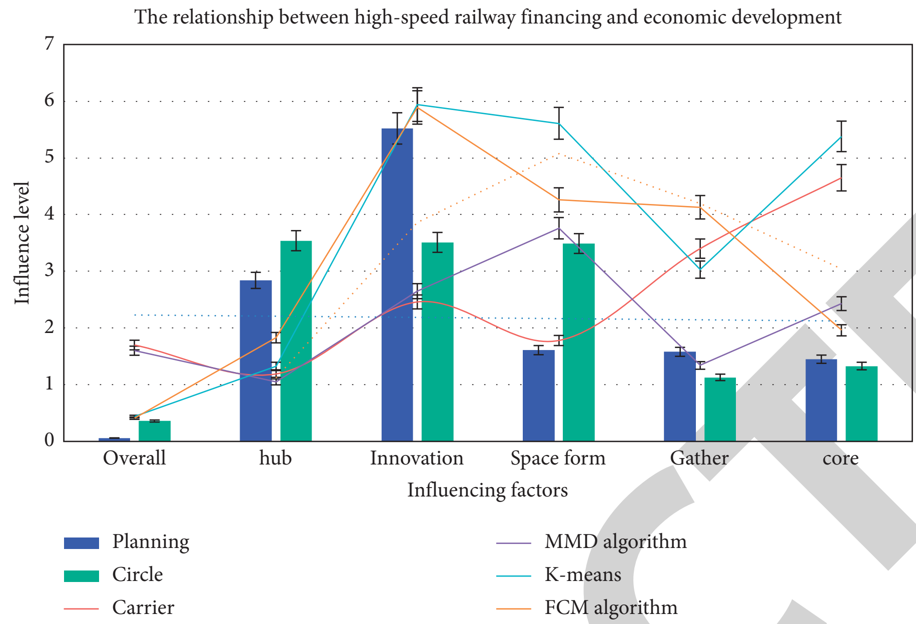

Figure 3: The relationship between high-speed railway financing and economic development.

Table 5: The overall planning of innovation resources.

Item	Planning	Circle	Carrier	MMD algorithm	K-means	FCM algorithm
Overall	0.06	0.36	1.7	1.6	0.44	0.41
Hub	2.84	3.54	1.19	1.05	1.33	1.83
Innovation	5.52	3.51	2.46	2.65	5.94	5.89
Space form	1.61	3.49	1.78	3.76	5.61	4.26
Gather	1.58	1.13	3.4	1.34	3.03	4.13
Core	1.45	1.33	4.65	2.43	5.38	1.96

Table 6: Relative index of economic evaluation of high-speed railway system.

Item	KMO	Economic	Load	Space form	Gather	Core
Safety	1.3	1.05	1.21	1.57	1.51	0.67
Continued	1.92	1.66	3.2	2.89	1.97	3.81
Development	2.17	5.68	2.61	5.77	3.47	3.33
Length	1.39	5.65	3.24	5.89	5.4	3.47
Core	2.31	1.31	4.45	1.25	4.02	4.91

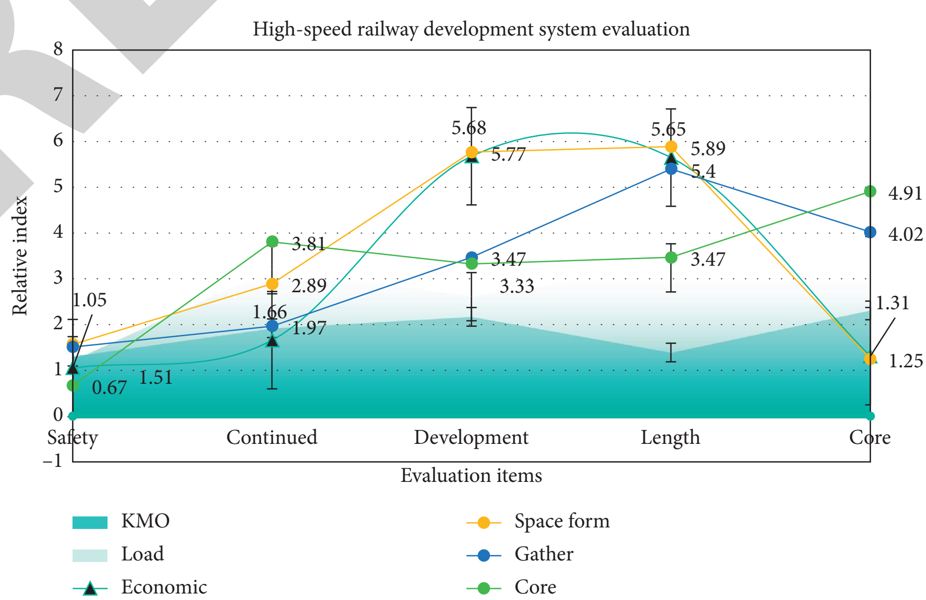

Figure 4: High-speed railway development system evaluation.

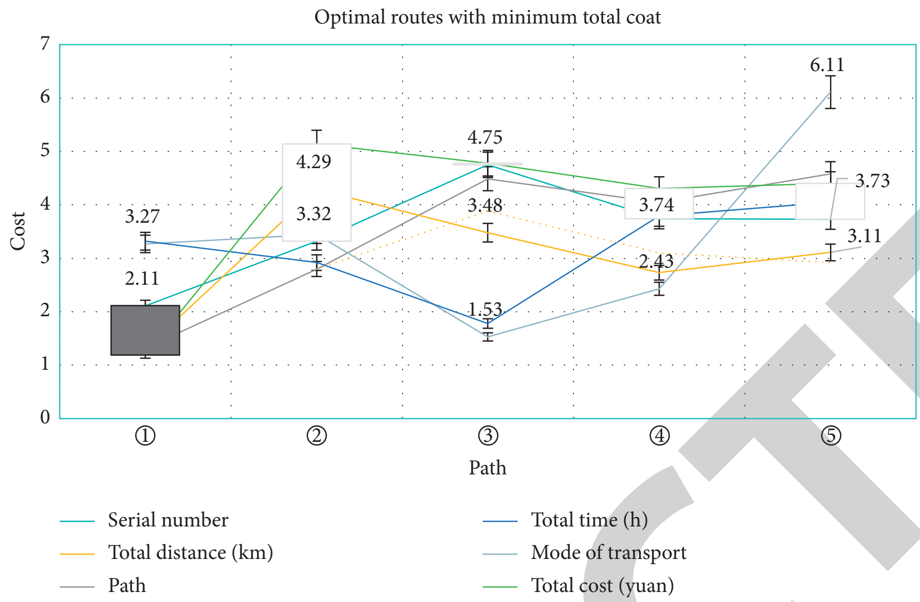

Figure 5: Optimal routes with minimum total cost (not existing time windows).

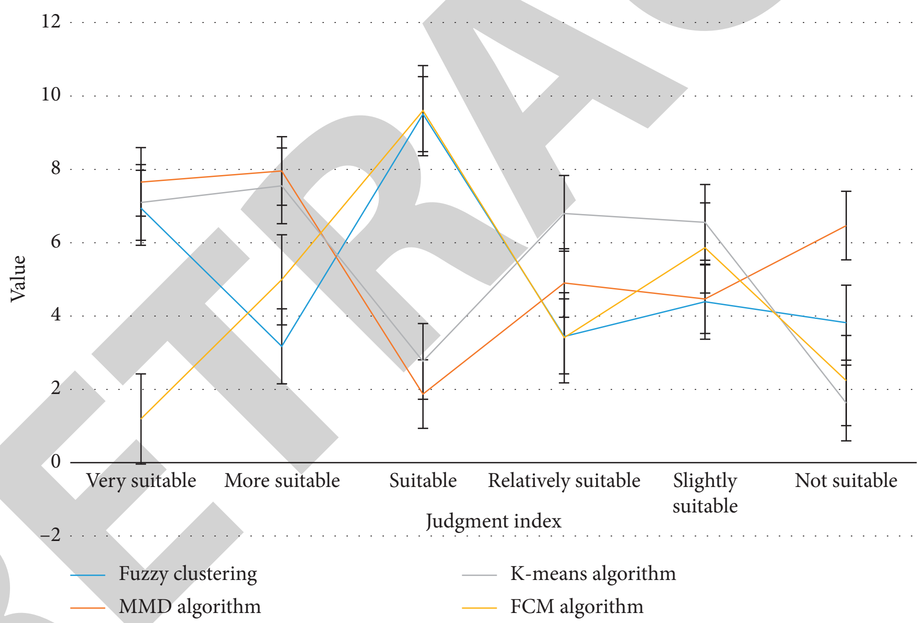

Figure 6: Judgement analysis diagram of evaluation index correlation.

Table 7: Optimal routes with minimum total cost.

Num.	Serial number	Path	Mode of transport	Total distance (km)	Total time (h)	Total cost (yuan)
①	2.11	1.32	3.27	1.31	3.32	1.19
②	3.32	2.8	3.45	4.29	2.92	5.14
③	4.75	4.49	1.53	3.48	1.78	4.78
④	3.74	4.05	2.43	2.73	3.79	4.31
⑤	3.73	4.58	6.11	3.11	4.05	4.4

Table 8: Judgement table for the relevance of evaluation indicators.

	Mean	Standard deviation	Standard error of the mean
Economic growth	−1.42	8.347	1.624
Financial situation	−2.64	7.324	1.628
Personnel employment and personnel salary by industry by region	0.67	7.685	1.623

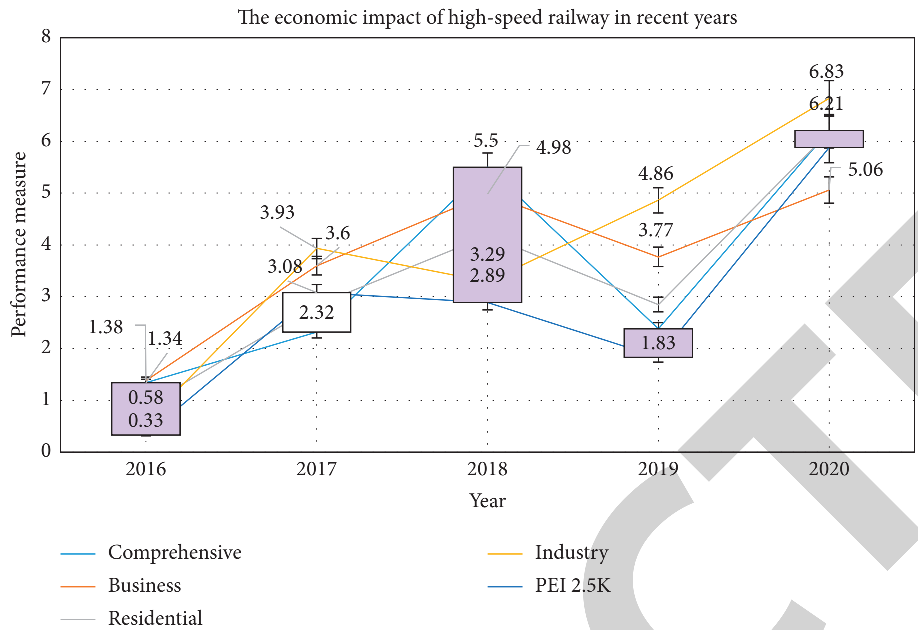

Figure 7: The economic impact of high-speed railway in recent years.

Table 9: Number of trials or attempts at learning.

Year	Comprehensive	Business	Residential	Industry	PEI 2.5 K
2016	1.34	1.38	0.9	0.58	0.33
2017	2.32	3.6	2.84	3.93	3.08
2018	5.5	4.98	4.18	3.29	2.89
2019	2.38	3.77	2.85	4.86	1.83
2020	6.21	5.06	6.18	6.83	5.88

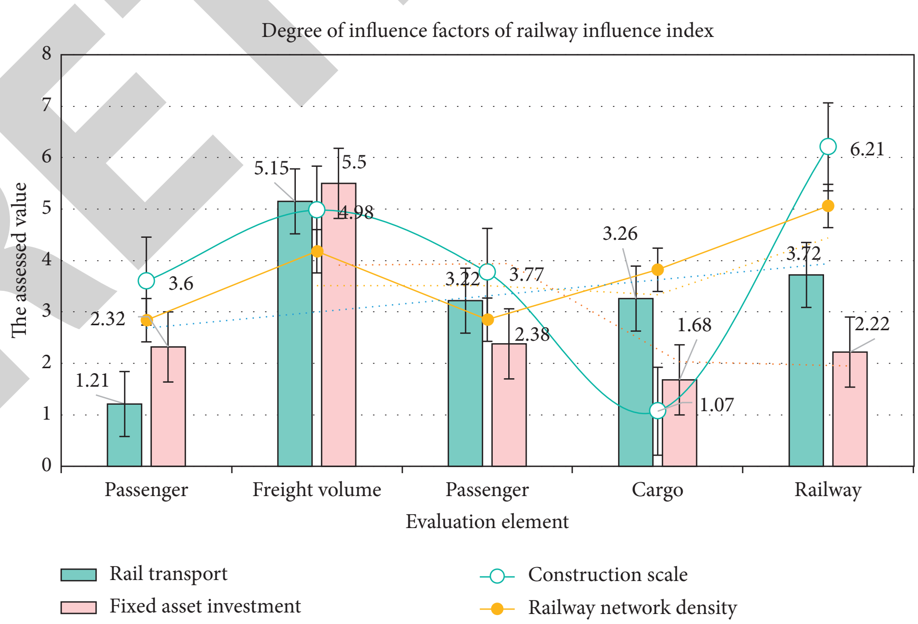

Figure 8: Degree of influence factors of railway influence index.

Table 10: Influencing factor data for railway impact indicators.

Item	Rail transport	Fixed asset investment	Construction scale	Railway network density
Passenger	1.21	2.32	3.6	2.84
Freight volume	5.15	5.5	4.98	4.18
Passenger	3.22	2.38	3.77	2.85
Cargo	3.26	1.68	1.07	3.82
Railway	3.72	2.22	6.21	5.06

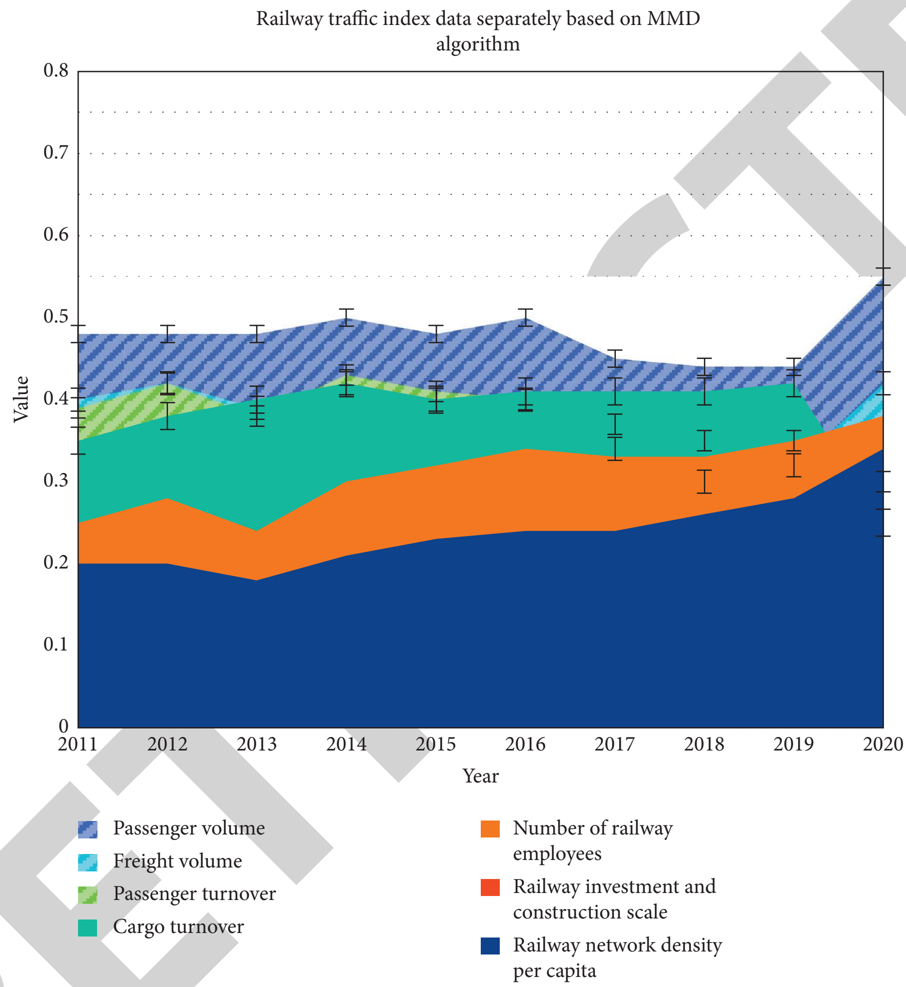

Figure 9: Research and analysis diagram of railway traffic index data separately based on MMD algorithm.

Table 11: Analysis table of the result analysis of the risk assessment system of Yebes algorithm.

	Mean	Standard deviation	Standard error of the mean
Economic growth	2.32	9.462	1.526
Financial situation	1.94	8.347	1.524
Personnel employment and personnel salary by industry by region	−1.46	9.432	1.529

Table 12: High-speed railway in recent years has prompted data.

Year	Interpersonal communication	Advantage	Weak	Opportunity	Threat
2016	0.63	0.87	0.32	0.81	1.4
2017	1.39	2.14	1.58	2.9	2.05
2018	2.29	2.37	5.96	2.4	3.73
2019	4.16	4.8	2.88	3.3	5.41
2020	2.28	4.35	3.48	4.32	4.02

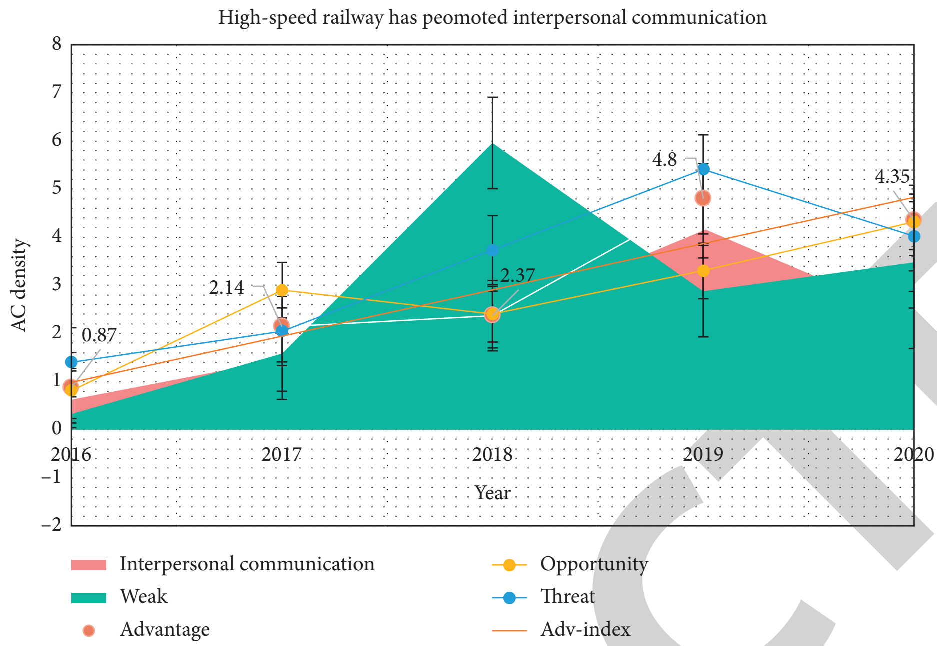

FIGURE 10: High-speed railway has promoted interpersonal communication.

The result is shown in Figure 9; at the same time, each sample is tested on the selected samples, and the mean, standard deviation, standard error of the mean, and other data are obtained, as shown in Table 11.

It can be seen from Table 12 that, at the same time each sample is tested in pairs, the standard error level of the mean is 0.002, which is less than 0.05, and high-speed railway construction can finally achieve economic integration. By improving the development of high-speed railways, continuously shortening time and space distances, breaking regional trade barriers, and reducing commodity circulation costs, industrial interaction and coordinated development among different regions can be effectively promoted.

As shown in Figure 10, relying on the high-efficiency and rapid advantages of high-speed railways drives the efficiency of personnel exchanges between different regions; through the release of existing line transportation capacity, the efficiency of cargo transportation is improved.

4.3.3. Regional Economic Index Data Based on MMD Algorithm. In terms of regional economy, we select six indicators of regional GDP, per capita GDP, per capita fixed asset investment, per capita retail sales of consumer goods, per capita import and export investment, and the proportion of tertiary industry added value in GDP and adjust the maximum number of iterations, learning rate, and maximum depth of the tree. Each iteration will produce a weak learner. As shown in Figure 11 and Table 13, if the number of weak learners is too small, it is easy to underfit, and if there are too many, it is easy to overfit. Each sample is tested on the selected samples, and data such as the mean, standard deviation, and standard error of the mean are obtained, as shown in Table 14.

It can be seen from Figure 12 that, at the same time each sample is tested in pairs, the standard error level of the mean is 0.015, which is less than 0.05, indicating that, in the future development of high-speed railways, it is necessary to clarify and solve the problems since the opening of high-speed railways.

It can be seen from Figure 13 and Table 15 that, along the railway line, the effect of high-speed railways on the regional economy will be reflected to the greatest extent. The specific manifestation is the use of transfer stations and the radiation effects of large- and medium-sized cities to gradually expand the formation of regional economic belts and continue to improve the road network planning. Based on the economic development of the central and western regions, pay attention to the construction of high-speed railway infrastructure in the central and western regions. For busy areas, consider increasing the auxiliary railway network.

As shown in Figure 14, in order to better present the simulation results, the calculation example parameters are set on the basis of real data. Refer to the national highway odometer, 12306 official website of high-speed railway operating mileage, and China Southern Airlines flight mileage for the node distance under different transportation modes. Since the transit time of the node gradually increases according to the transportation process, the setting of the

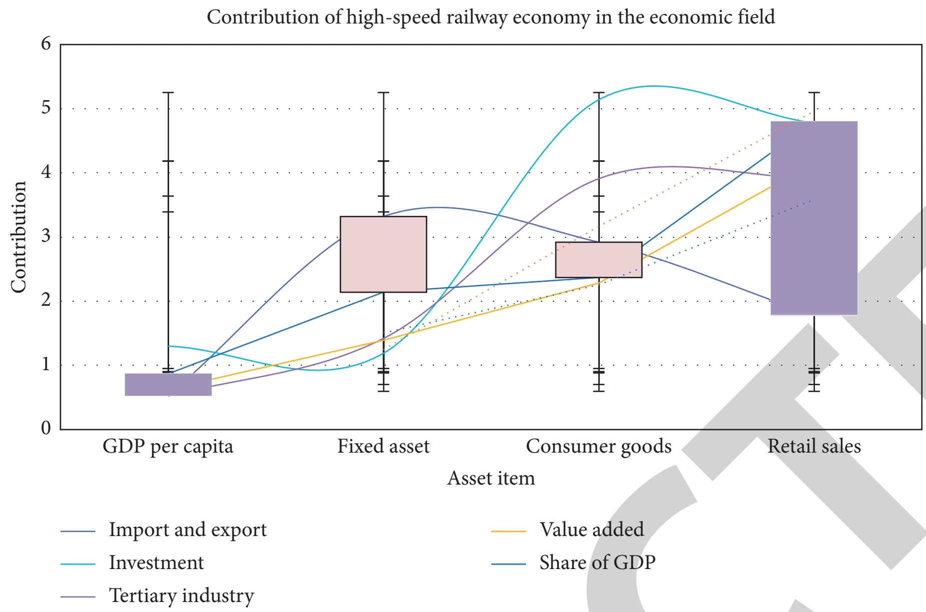

Figure 11: Contribution of high-speed railway economy in the economic field.

Table 13: High-speed railway economic data in the economic field.

Item	Import and export	Investment	Tertiary industry	Value added	Share of GDP
GDP per capita	0.53	1.3	0.52	0.63	0.87
Fixed asset	3.32	1.19	1.42	1.39	2.14
Consumer goods	2.92	5.14	3.91	2.29	2.37
Retail sales	1.78	4.78	3.92	4.16	4.8
Investment	3.79	4.31	2.22	2.28	4.35

Table 14: IBk algorithm risk assessment system analysis table of results.

	Mean	Standard deviation	Standard error of the mean
Economic growth	1.49	11.624	1.965
Financial situation	1.42	11.523	1.923
Personnel employment and personnel salary by industry by region	−1.33	9.643	1.275

node service time window follows a certain order of increase. The transportation unit price, transit time, transit cost, and time window data are shown in Table 16. Among them, the high-speed railway and aviation time window widths at the nodes are set to 0.5 and 1 h, respectively.

As shown in Figure 15 and Table 17, most of the previous researches on multimodal transportation routes tend to be in the ideal state of no node time window. If the alternative transportation mode has no service time window constraint at the node, there is no need to wait for the goods in the transit process, and the transit efficiency will be improved, a substantial increase. Under the condition of keeping the assumptions and other parameter settings unchanged, the path model without node time window is solved, and the optimal path is obtained as follows: AEHNO, the transportation mode combination is [3, 1, 1, 1], and the total transportation distance is 3654 km, the total path time is 28.29 h, and the total cost is 31057.38 yuan. Analyze and output the five path schemes with the smallest total cost, as shown in Table 5.

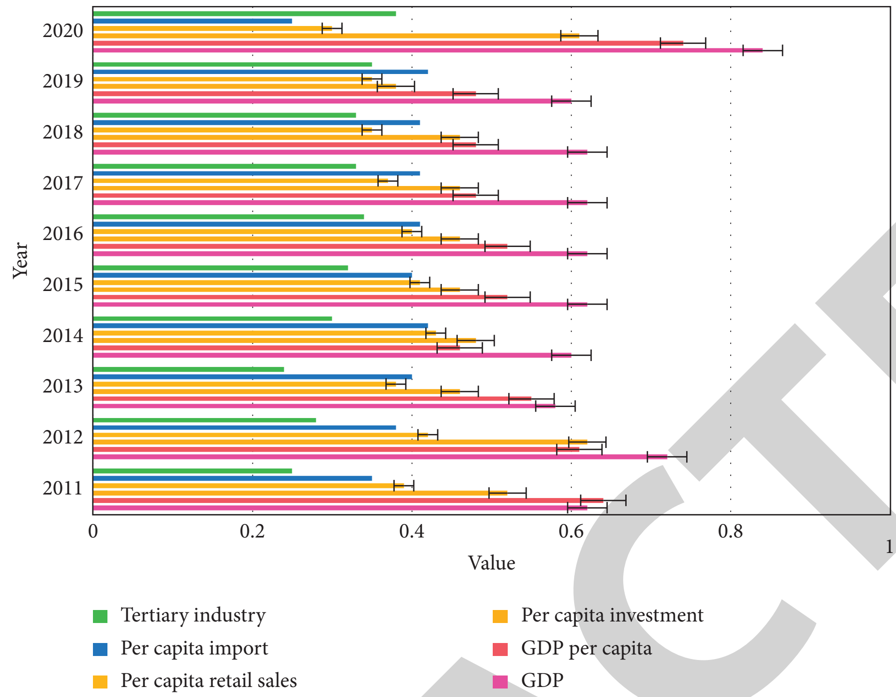

FIGURE 12: IBk algorithm-based risk assessment system to analyze the results.

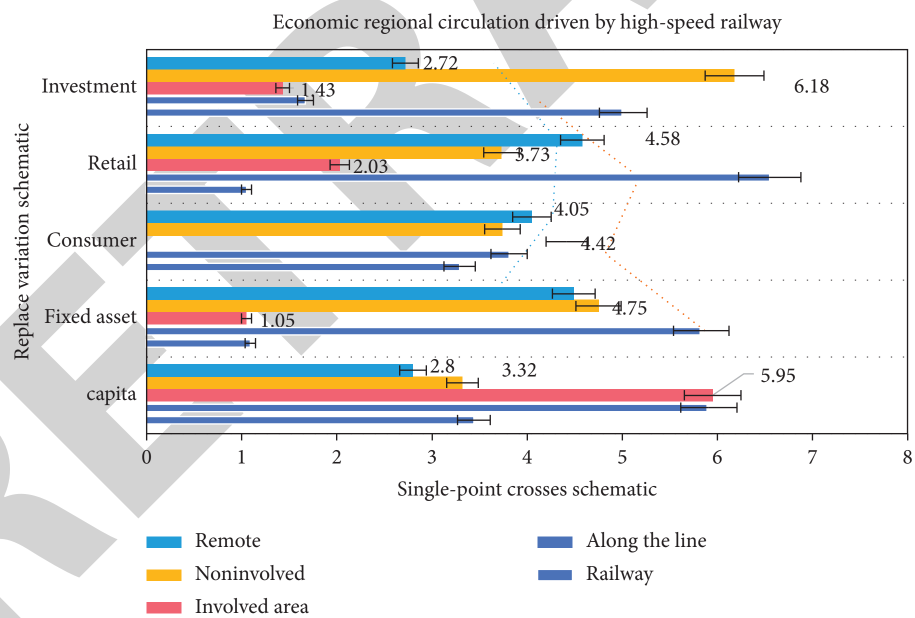

FIGURE 13: Economic regional circulation driven by high-speed railway.

TABLE 15: Economic area circulation data.

Item	Railway	Along the line	Involved area	Noninvolved	Remote
Capita	3.44	5.91	5.95	3.32	2.8
Fixed asset	1.09	5.83	1.05	4.75	4.49
Consumer	3.29	3.81	4.42	3.74	4.05
Retail	1.05	6.55	2.03	3.73	4.58
Investment	5.01	1.67	1.43	6.18	2.72

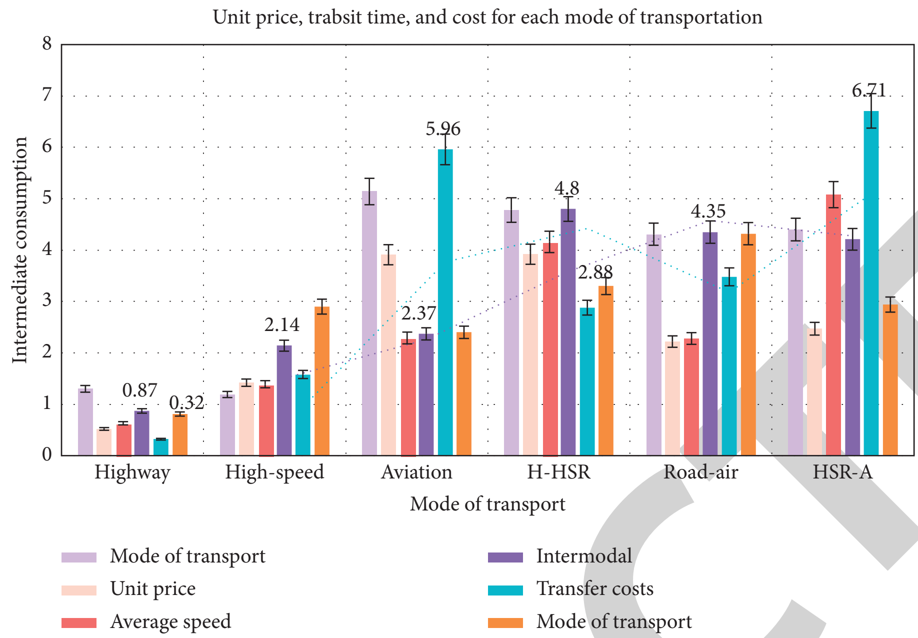

FIGURE 14: Unit price, transit time, and cost for each mode of transportation.

TABLE 16: Unit price, transit time, and cost for each mode of transportation.

Mode of transport	Mode of transport	Unit price	Average speed	Intermodal	Transfer costs	Mode of transport
Highway	1.3	0.52	0.63	0.87	0.32	0.81
High-speed railway	1.19	1.42	1.39	2.14	1.58	2.9
Aviation	5.14	3.91	2.29	2.37	5.96	2.4
Highway-high	4.78	3.92	4.16	4.8	2.88	3.3
Road-air	4.31	2.22	2.28	4.35	3.48	4.32
High-speed railway-aviation	4.4	2.47	5.08	4.21	6.71	2.94

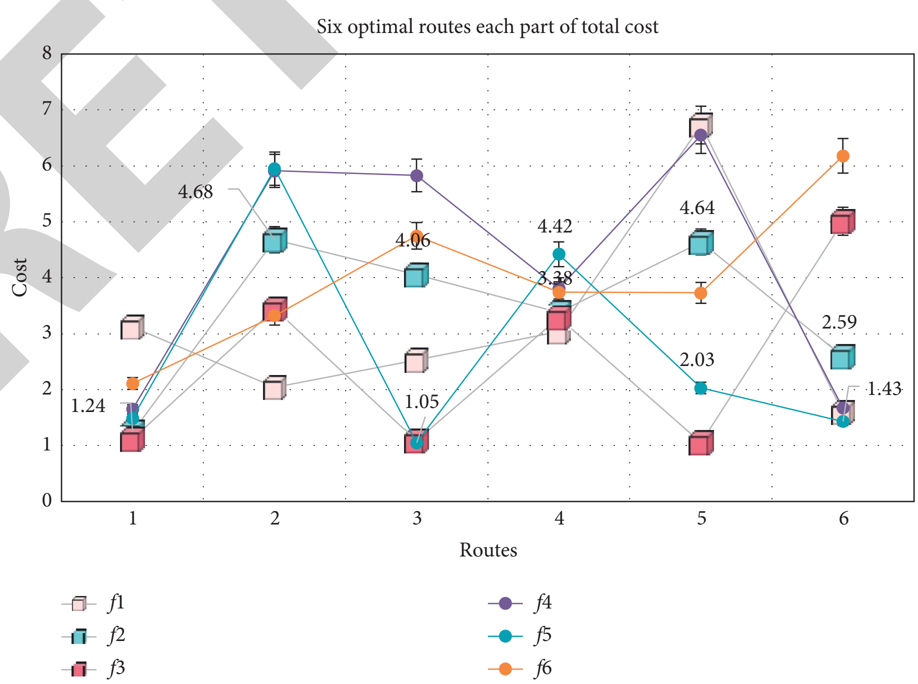

FIGURE 15: Six optimal routes of each part of total cost.

Table 17: 6 optimal routes of each part of total cost.

Num.	f_1	f_2	f_3	F_4	f_5	f_6
1	3.12	1.24	1.12	1.65	1.49	2.11
2	2.04	4.68	3.44	5.91	5.95	3.32
3	2.53	4.06	1.09	5.83	1.05	4.75
4	3.04	3.38	3.29	3.81	4.42	3.74
5	6.73	4.64	1.05	6.55	2.03	3.73
6	1.59	2.59	5.01	1.67	1.43	6.18

5. Conclusions

The data storage system ensures the timeliness and sharing of inventory data. In the past, data inventories used inventory personnel to access and manually import electronic devices. The existing system can meet the direct input of the electronic inventory unit, and the inventory staff can view and modify it in real time, thereby saving time; at the same time, the inventory data network can allow all levels from the top to the bottom to control and process the data to avoid a situation that the superior had to submit long data to subordinates to understand the data status and the system to perform data exchange. The intelligent data analysis system uses the current popular data mining technology. National financial inventory data meets a number of characteristics. Although it has some possible laws, there are inevitably many inherent problems, which are difficult to find. Generally speaking, big data has broad prospects for the development of information services in integrated transportation hubs, which need to be explored.

Because the traditional economy cannot conduct comprehensive research on various factors that affect the economy, this article analyzes data mining technology in a targeted manner to find a data mining algorithm suitable for regional economic analysis. Enhancing the accessibility of the railway transportation system will bring about huge economic benefits to the region, and improving the economic benefits will enable the country to increase the construction of railway transportation facilities to better serve economic development and improve the relationship between the two. Development is also an important way to promote the sustainable and healthy development of cities. Strengthening the importance of coordination between the two and studying the interaction between railway accessibility and regional economic development are important research topics for China's railway development.

There is a two-way feedback mechanism between the railway transportation system and the regional economic system. Railway transportation mainly affects the regional economy from two aspects: the overall economy and the spatial industrial structure. The investment in railway construction will affect the expansion of the regional structure and provide new impetus for economic development. On the contrary, the development of the regional economy will have a positive impact on railway transportation from three aspects: the supply of construction funds, the demand for railway transportation, and the supply of labor and technology. The survey results show that, in order to maintain the coordination between railway transportation and regional economic development, the state must control the investment in railway construction to achieve a virtuous circle, narrow the gap between regions, and improve the level of coordination.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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