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Research Article

Assessment of Jiangsu Regional Logistics Space Nonequilibrium Situation by Boosting and Bagging Algorithms

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This study aims to solve the problem of unbalanced regional economic development in Jiangsu and deeply excavates the relevant theories of regional logistics and the unbalanced spatial situation. The classification of regional logistics and spatial disequilibrium and the dimensions involved are studied. At present, the development status of Jiangsu logistics has locked the main reason for the unbalanced situation of the regional logistics space in Jiangsu. The basic principles, application scope, and methods of Bagging and Boosting algorithms are deeply studied. Then, the Jiangsu logistics space nonequilibrium situation assessment model is established based on the Bagging and Boosting algorithms, and the input data is sorted and summarized. Finally, the results are obtained through experiments evaluating the model and analyzed and summarized. The core issues, the factors affecting development, and the uneven development situation have been comprehensively assessed. The conclusion drawn is as follows: the imbalance of the logistics productivity of various regions in Jiangsu will inevitably lead to the imbalance of the regional logistics space in Jiangsu, which affects the coordinated and healthy development of the regional logistics in Jiangsu. These conclusions are significant to the inherent causes and effects of regional logistics spatial disequilibrium and can promote the coordination, synergy, and common development of Jiangsu logistics regions.

1. Introduction

In recent years, the industrial chain and supply chain of various countries have been restructured at an accelerated pace. The economic structure is changing, and uncertainties and risks are also increasing, but the task of economic growth is still arduous. The foundation and supporting roles of logistics in the modern market economy are becoming more and more significant, and it has been theoretically supported in the factors of economic growth [1]. China's logistics has been affected by the ideology of "emphasizing production and neglecting circulation" and restricted by the divided circulation system. Logistics has not received due attention and development. It was not until 2001 that modern logistics officially entered China's economic stage. Development of China's logistics has mainly gone through three historical stages: the traditional planned storage and transportation stage (after the founding of the People's Republic of China to before the 1980s), the introduction stage of logistics concepts (from the 1980s to the end of the 1990s), and the initial development stage (the beginning of the 1990s to now). These three stages completely reflect the development process of China's logistics and reflect China's transformation from a weak logistics country to a strong logistics country. From borrowing and learning from excellent experiences to promoting China's own logistics development, the level of logistics has been improving, but there are still many areas for improvement.

From a practical point of view, regional logistics has become the key to regional economic growth. The factors of regional economy have obtained theoretical support and practical application in the research. In recent years, problems such as unbalanced development of China's logistics have become more prominent, which have become the core factors for the unhealthy development of the logistics industry. Therefore, this also makes the optimal planning of industrial resource distribution and the coordinated development of regional economy cannot be carried out smoothly [2]. Jiangsu is a typical province in China whose geographical location spans south and north. Therefore, the unbalanced state of regional logistics development in Jiangsu can represent China's typical unbalanced regional logistics development. Boosting and Bagging algorithms can be used to study it. Boosting is an effective ensemble learning method suitable for supervised classification tasks. Among the more popular Boosting methods at present, there are mainly AdaBoost, Savage Boost, Tangent Boost, and Taylor Boost [3]. The AdaBoost algorithm is discussed. In 1996, the Bagging algorithm was proposed by Breiman et al. [4]. The algorithm has become a well-known representative of ensemble learning methods. Bagging algorithm is based on the bootstrapping sampling method to self-resample from training data [5]. When performing sampling operations, the convenience of the Bagging method is that it does not need to know the true distribution of the samples [6]. In the sampling process, independent repeated sampling with replacement is performed, and the obtained multiple training sample sets are used.

At present, the economic development of Jiangsu province is still in a period of important strategic opportunities. The opportunities and challenges faced by the development of its logistics industry have new changes. The southern Jiangsu is mainly dedicated to the dedicated line, and the northern Jiangsu is mainly stowage. The logistics parking lots in Nanjing, Wuxi, Changzhou, and Wuxi in southern Jiangsu are developed, with Wuxi being the most developed, and there is logistics development in southern, central, and northern Jiangsu. The regional and unbalanced characteristics of it are obvious [7]. In recent years, the Jiangsu region has gradually shown problems of unbalanced economic development, resources, development location, logistics layout, development scale, and development level. According to the history and the facts of Jiangsu regional logistics development, Jiangsu territorial space planning in the new century is taken as the foundation. The present situation of the logistics foundation and development conditions of 13 cities in the three major regions are different. The allocation of logistics resource elements is differentiated, focusing on the integrated development trend of the Yangtze River Delta to explore the unbalanced situation and endogenous evolution mechanism of Jiangsu regional logistics space, and based on the empirical results, the system design and countermeasures of unbalanced and coordinated development are put forward. The innovation point lies in the construction of a new framework of integrated analysis from the perspective of the disequilibrium situation of regional logistics space, from the two levels of region and city, and from the time and space dimensions to reveal the disequilibrium nature of regional logistics space more vividly and comprehensively. These contents supplement the connotation of regional logistics space nonequilibrium, clarify its real status and development context, form a new three-dimensional understanding, and improve the regional logistics space nonequilibrium research system. This research urgently needs to enhance the endogenous power of regional logistics development, promote high-quality development of regional logistics in Jiangsu, and solve the unbalanced and insufficient regional logistics. The new requirement is also an important way to improve the pertinence and effectiveness of the coordinated development policy of regional logistics in Jiangsu and to better meet the construction of a modern economic system and the people's growing demand for logistics services. Additionally, these conclusions provide useful experience and reference for narrowing the gap in China's regional logistics development, improving the efficiency of resource allocation, and solving the problem of unbalanced and uncoordinated regional development, and have important practical application value.

2. Algorithms and Models

2.1. Current Situation of Unbalanced Situation of Regional Logistics Space in Jiangsu. Regional logistics is a system that can adapt to regional characteristics and functions and meet regional economic development. It is composed of regional logistics networks, information support, and organizational operations. The situation of regional logistics is initially a theoretical assessment for developing countries to achieve economic development goals. This theory has become the theoretical basis that is often cited and referenced in regional development and planning [8]. The development of the social division of labor and regional division of labor is constantly changing the logistics industry structure in various regions. The formation, development, and substitution of the logistics industry make the structure of the logistics industry change all the time to promote the continuous improvement of the industry level. Judging from the current specific situation in China, the logistics industry includes three aspects, and its industry has three properties, as shown in Figure 1.

In Figure 1, the logistics industry involves a variety of industries. It has three properties, and its content is different [9]. Its basic industry is composed of different transportation lines, junctions, nodes, and terminals, which provide the basis for the operation of each link of the economic system, as shown in Figure 1(a). The logistics equipment manufacturing industry is an element that provides means in the logistics production labor and can use more advanced technology to provide modern equipment to the traditional manufacturing industry. The logistics information industry is the core in providing software and hardware support for the system, including system management and services, and is a combination of information technology and communication technology [10]. Regional logistics generally refers to regional logistics and local logistics. Its features are shown in Figure 2.

In Figure 2, spatial resource differences are the economic basis of regional logistics, including natural and social resources. There are specific natural and social resources in different regions [11]. Spatial resources in any region cannot be completely balanced, especially in regional logistics. The level of logistics service is in line with the economic development, and the division of its regions is mainly determined according to the degree of economic development. The contents of different regional logistics systems are

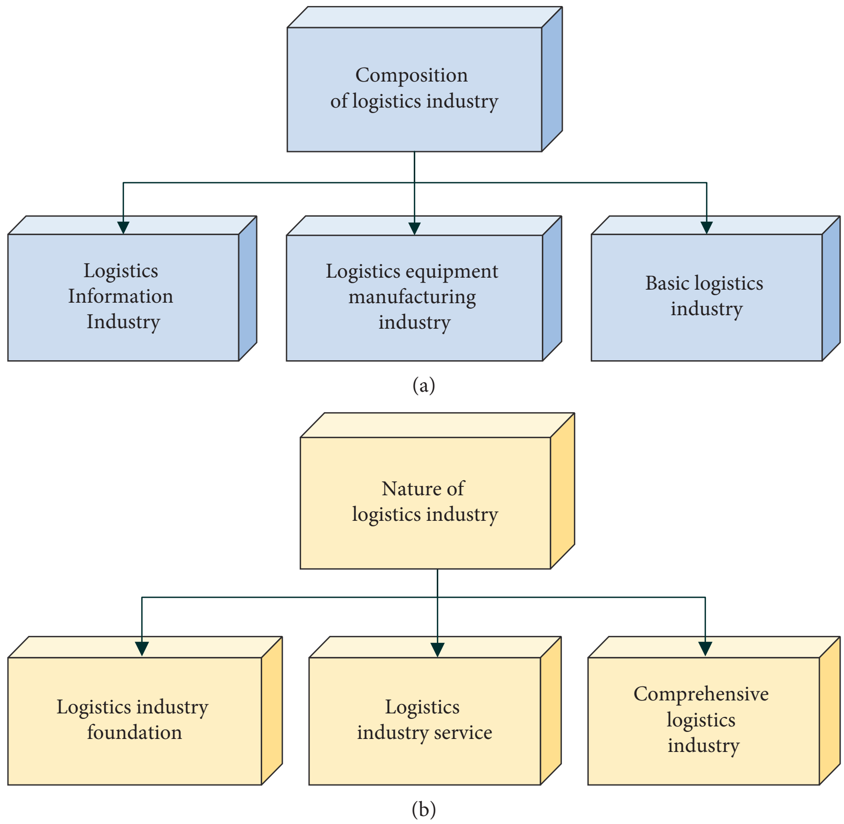

Figure 1: Levels and properties involved in the logistics industry: (a) involved levels and (b) industry nature.

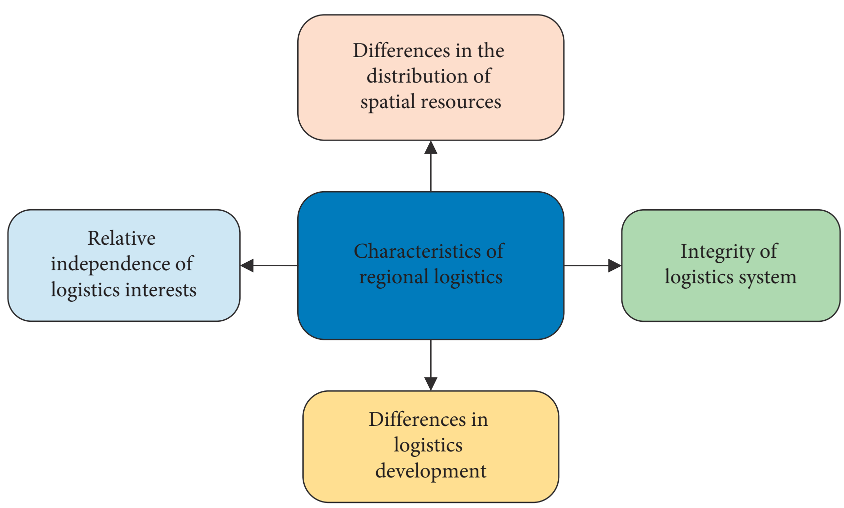

Figure 2: Features of regional logistics.

different, and in essence, it is a structure that is interconnected and restricted to each other. In other words, some regional logistics system integrity may be higher, and some may be lower. However, there is a certain number of logistics systems between regions.

At present, China's understanding and mastery of the concept of unbalanced development are defined as the unbalanced or unbalanced phenomenon or significant difference in the distribution of resources, accumulation of wealth, economic income, and exercise of rights among different regions, industries, and groups in the development process [12]. The disequilibrium theory has several characteristics, as shown in Figure 3.

In Figure 3, the characteristics of the nonequilibrium situation are obvious. Firstly, it has greater realism. The disequilibrium theory breaks through the shackles of general equilibrium theory, faces the disequilibrium phenomenon in real economic life, and draws some theoretical conclusions that are more realistic. It provides a rigorous framework for research resource allocation [13]. Regional unbalanced

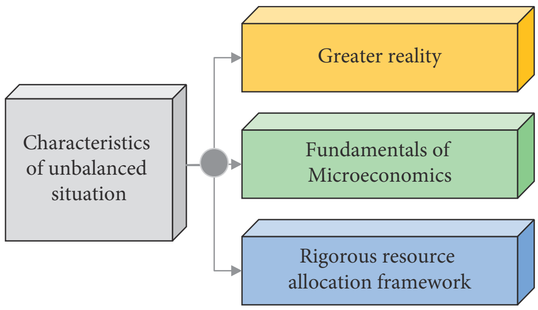

Figure 3: Features of the disequilibrium theory.

development is related to balanced regional development, and it is divided according to the law of unbalanced development of regional economy, not evenly. China's regional economic unbalanced development strategy is gradually maturing, maintaining a moderate economic gap between regions within a certain period and developing in an orderly manner, ultimately realizing the common development of the national economy. The data model of its core development is shown in Figure 4.

In Figure 4, the advantage of this model is that it is conducive to highlighting key points, concentrating advantageous resources, and allowing some regions, some industries, and some people to develop. The disadvantage is that this model has led to the widening of the regional, urban, and rural income gap, unbalanced economic development, and imbalanced income structure [14]. The nonbalanced development strategy refers to the strategy of investing limited resources in the regions and industries with higher efficiency first to obtain high-speed growth of the regional economy and promote the development of other regions and industries.

Jiangsu province has a huge geographical advantage. It spans from north to south and, together with Shanghai, Zhejiang, and Anhui, constitutes one of the world-class urban agglomerations in the Yangtze River Delta. The development of various transportations in Jiangsu province is relatively high in the country. It has four comprehensive national transportation hubs, enabling the rapid development of regional logistics. At present, the logistics industry has become the key growth point of Jiangsu's economic development. The overall logistics industry is developing rapidly, but the spatial imbalance of regional logistics is still a problem that plagues the coordinated development of regional logistics in Jiangsu [15]. The analysis and measurement of the spatial differences of regional logistics in Jiangsu, the in-depth discussion of the spatial differences in the development of logistics in various regions, the static comparative analysis, and the trend of trend change characteristics are indispensable links to explore the assessment of the nonequilibrium situation of regional logistics in Jiangsu.

According to incomplete statistics, there are 49 logistics parks in Jiangsu. Among them, there are ten logistics parks in Wuxi, five logistics parks each in Xuzhou and Changzhou, and four logistics parks in Yancheng, Zhenjiang, Nanjing, and Suzhou. The development of key logistics parks in

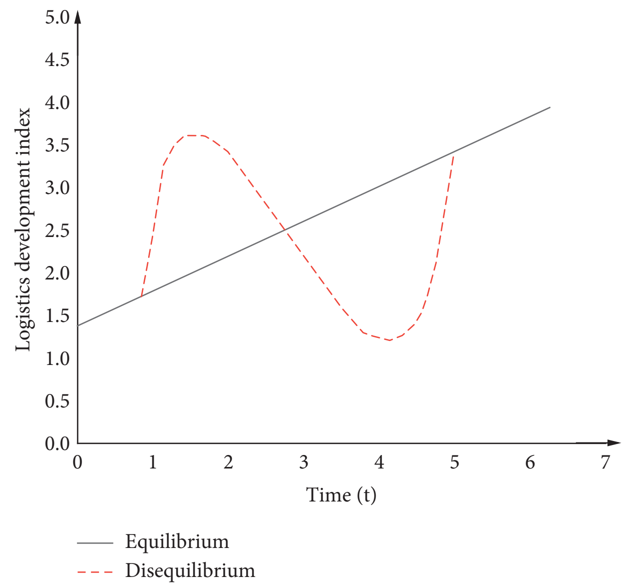

Figure 4: Model of the regional unbalanced logistics development data.

Jiangsu is generally good. Whether it is infrastructure, operational efficiency, or park functions and service capabilities, they are constantly improving. With the in-depth implementation of the "Internet +" strategy, the key logistics parks in Jiangsu province have strengthened innovation-driven development and gradually developed into diversified formats such as "Internet + logistics" and "logistics + business", instead of relying solely on traditional modes of transportation, storage, and trade. This model accelerates the transformation and upgrading of the park [16]. In addition, the development of logistics parks in Jiangsu province is facing four major problems and challenges. The specific problems and challenges are shown in Figure 5:

In Figure 5, the construction of the Jiangsu logistics area has problems such as inadequate implementation and unreasonable project layout. The phenomenon of duplication of content and construction of logistics parks is common. Some even blindly occupy land out of actual market demand. Problems such as insufficient innovation, single business, and brand influence in the park are obvious, resulting in low overall operating efficiency [17]. At present, less than one-third of all key logistics parks in Jiangsu province has developed diversified businesses, and the proportion of business volume is relatively low. In response to the above problems, the freight situation of the three major regions in Jiangsu is sampled and collected. The standard deviation and mean data of the freight situation are shown in Figure 6.

In Figure 6(a), from the perspective of the road freight volume of the three regions, there are significant differences and large fluctuations in the road freight volume of the three regions. Among them, southern Jiangsu and northern Jiangsu have staggered growth, and northern Jiangsu > southern Jiangsu > central Jiangsu, and northern Jiangsu ranks first in the freight volume of the three major regions [18]. The standard deviation of the northern and

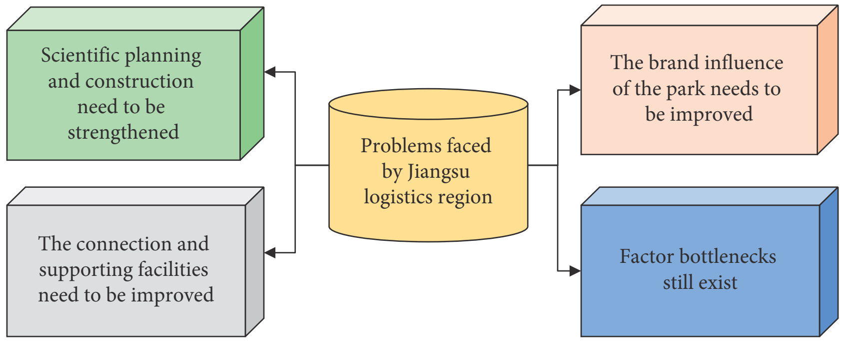

Figure 5: Development problems of logistics parks in Jiangsu province.

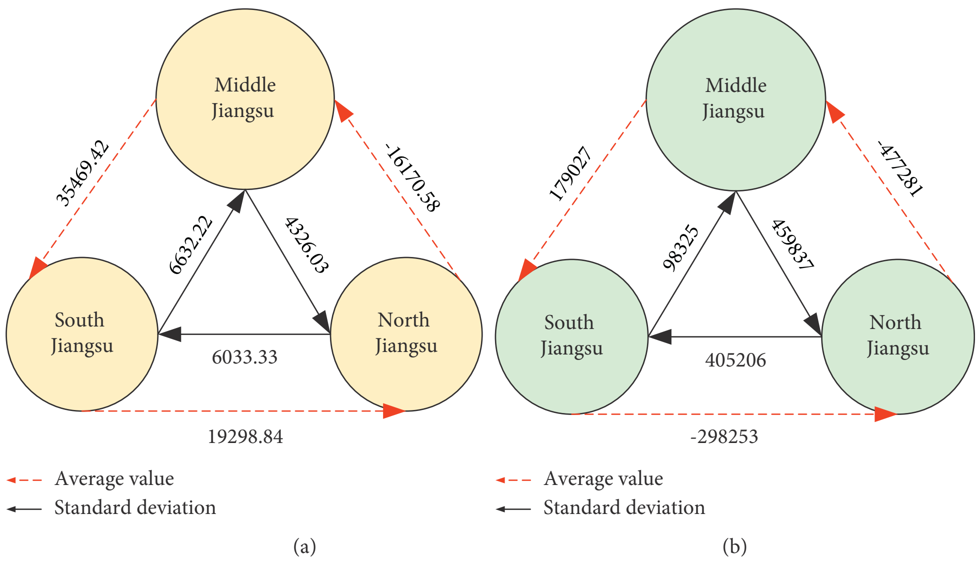

Figure 6: Standard deviation and average data of freight transportation in the three major regions of Jiangsu: (a) freight volume and (b) turnover.

southern Jiangsu regions reached 6632.22, indicating that the difference in road freight volume between the northern and southern Jiangsu regions was the largest. In Figure 6(b), there are significant differences in road freight turnover between the southern Jiangsu, the central Jiangsu, and the northern Jiangsu. Northern Jiangsu > southern Jiangsu > central Jiangsu. The standard deviation between the northern Jiangsu and the central Jiangsu even reached 459837, indicating that the difference in road freight turnover between the northern Jiangsu and the central Jiangsu is the largest [19].

2.2. Bagging and Boosting Algorithms. Bagging and Boosting algorithms combine existing classification or regression algorithms in a certain way to form a more powerful classifier. This is a method of assembling a classification algorithm. This is a method of assembling weak classifiers into strong ones. Bagging is the bagging method [20], and its algorithm flow is shown in Figure 7.

In Figure 7, there is indeed no connection between the weak learners of Bagging like Boosting [21], which is characterized by "random sampling." Random sampling is to collect a fixed number of samples from the training set, but after each sample is collected, the samples are put back. Previously collected samples may continue to be collected after being returned. For the traditional Bagging algorithm, the same number of samples as the training set sample m is generally collected randomly [22]. The number of samples obtained in this way is the same as that of the training set, but the content of the samples is different. If the training set of m samples is randomly sampled N times, the N sample sets are different due to randomness. The basic classifier is usually learned from an existing algorithm, so ensemble learning does not create new algorithms but combines existing algorithms. The integration adopted is shown in the following equation:

$$M = \{(x_1, y_1), (x_2, y_2), \ldots (x_m, y_m)\}. \tag{1}$$

Among them, M is the number of samples, x and y are the label values, and y belongs to the set [-1,1].

$$P_\theta(y) = \frac{1}{k}\sum_i P\left(y^i\right), \tag{2}$$

k is usually set to 100, and it is the number of random tree models. P is the integrated value of the entire algorithm.

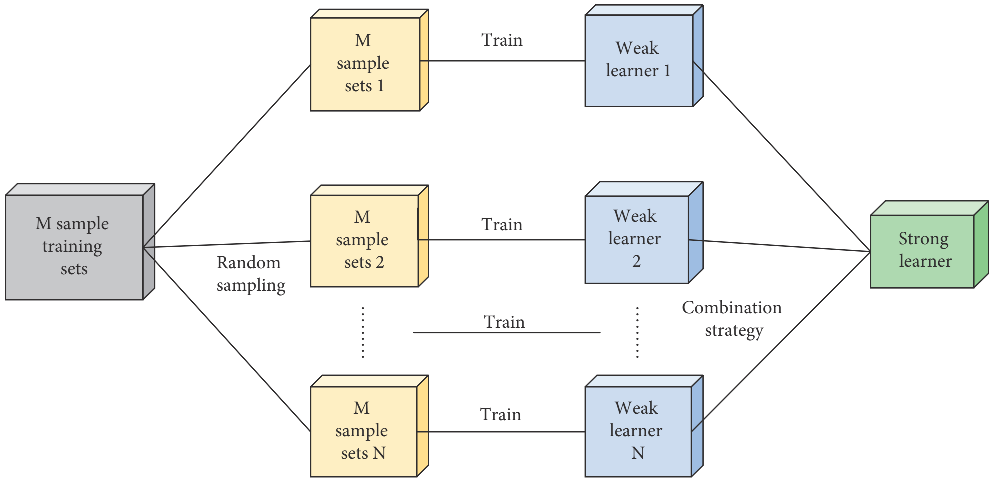

Figure 7: Flowchart of the Bagging algorithm.

$$P_\theta(y=N)=\frac{1}{k}\sum_i P\left(y^i=N\right), \text{Error}=P\left(F_i(x)\neq f_i(x)\right)=e. \tag{3}$$

Error is the assumption error of the weak classifier, *x* and *y* are both label values, *y* belongs to the set [-1, 1], and F(x) is the real label.

$$C(x)=\operatorname{sign}\left(\sum_{i=1}^{N}F_i(x)\right), \tag{4}$$

i is a single sample number belonging to the set [1, N]. C is the correct computation result of the classifier.

The Boosting algorithm reduces the weights of the samples that are classified incorrectly by the weak classifier in the previous round by increasing the weights of the samples that are wrongly classified by the weak classifier in the previous round [23], so that the classifier is more accurate to the wrongly classified data. The additive model linearly combines the weak classifiers, and the weight of the classifier with a small error rate is increased by a weighted majority voting method. The weight of the classifier with a large error rate is decreased. Additionally, the residual error is gradually reduced by fitting the residual error, and the models generated at each step are superimposed to obtain the final model. The flow of the Boosting algorithm is shown in Figure 8.

In Figure 8, the Boosting algorithm is an algorithm that promotes a weak learner to a strong learner [24]. For a complex task, the sum of multiple judgments is more accurate than any single judgment. The working mechanism of the algorithm is to train a weak learner from the initial training set and then adjust the distribution of training samples according to the performance of the weak learner. The samples that are misclassified by the weak learner before are adjusted later. Then, the next weak learner is trained based on the adjusted samples, and so on repeated until the criterion is met. In general, the boosting method builds a model in a step-by-step and iterative manner. The weak learner built in each iteration step is to make up for the deficiencies of the existing model and finally generate a strong learner [25].

Both Bagging and Boosting algorithms combine existing classification or regression algorithms in a certain way to form a more powerful classifier. This is an assembly method of a classification algorithm, that is, a method of assembling weak classifiers into strong classifiers. But the two algorithms have different differences, as shown in Table 1.

2.3. Establishment Model. In order to be able to determine the pivot and pivot cities in the spatial pattern of regional logistics development, the pivot, that is, the main logistics node city generally chooses the city with a higher "quality" of urban logistics. The development level of urban logistics is higher, the logistics demand is big, the basic logistics infrastructure is sufficient, and the comprehensive logistics ability is strong. The pivot point is a secondary logistics node city. Its logistics development level, facility status, market demand, and functional orientation are weaker than the pivot city, which is a subsidiary of the pivot. Under the condition that these theoretical foundations and algorithms are available, there is no unified standard for evaluating the unbalanced situation of regional logistics space. The spatial nonequilibrium situation of regional logistics reflects the comprehensive strength of regional logistics and is a comprehensive index of complexity. The key step is to establish a complete evaluation model to comprehensively evaluate the characteristics and status of regional logistics space nonequilibrium in Jiangsu, which can measure the comprehensive strength of regional logistics development. The indicators to measure the comprehensive strength of regional logistics development are mostly based on the quality of various indicators and the reliability of the data sources. The model selects three evaluation indicators, namely, the level of regional economic development, the scale of regional logistics supply, and the construction of regional logistics infrastructure, as shown in Figure 9.

In Figure 9, the scale of regional logistics supply is an important indicator reflecting the ability of regional logistics demand, and it is also a manifestation of the vitality of the regional logistics development. The regional logistics

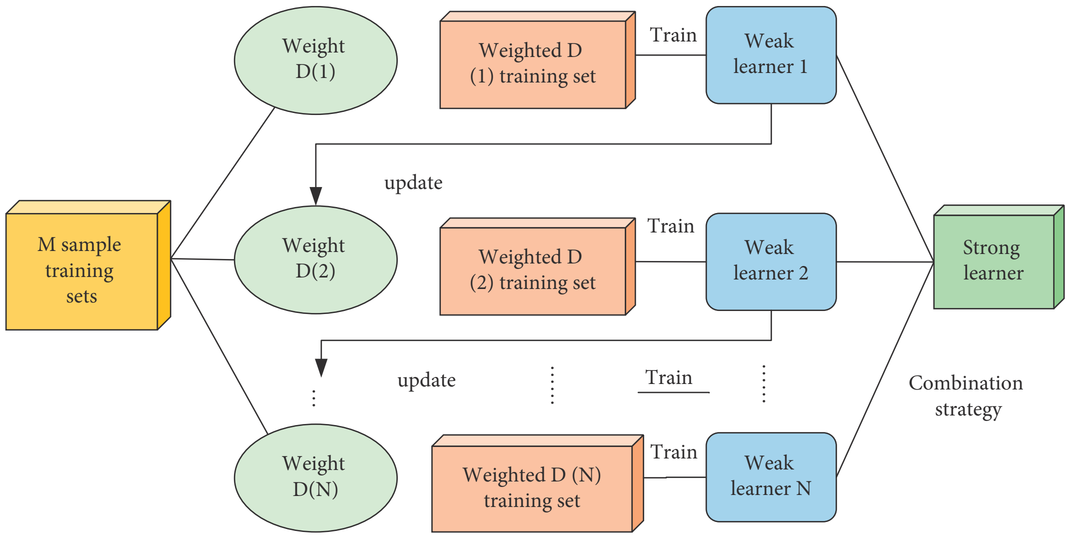

FIGURE 8: Algorithm flow chart of Boosting.

TABLE 1: Differences between Boosting algorithm and Bagging algorithm.

	Boosting	Bagging
Sample selection	The training set of each round is unchanged, but the weight of each sample in training set in the classifier changes. The weights are adjusted according to the results of the previous round of classification.	The training set is selected with replacement, and each round of training sets selected from the original data set is independent.
Sample weight	The weight of the sample is continuously adjusted according to the error rate—the greater the error rate, the greater the weight of the sample.	Use uniform sampling, with equal weights for each sample.
Prediction function	Each weak classifier has a corresponding weight, and a classifier with a small classification error will have a larger weight.	All predictors have equal weights.
Parallel computing	Each prediction function can only be generated sequentially because the latter model parameters need to be combined with the model results of the previous round.	Individual predictors can be generated in parallel.

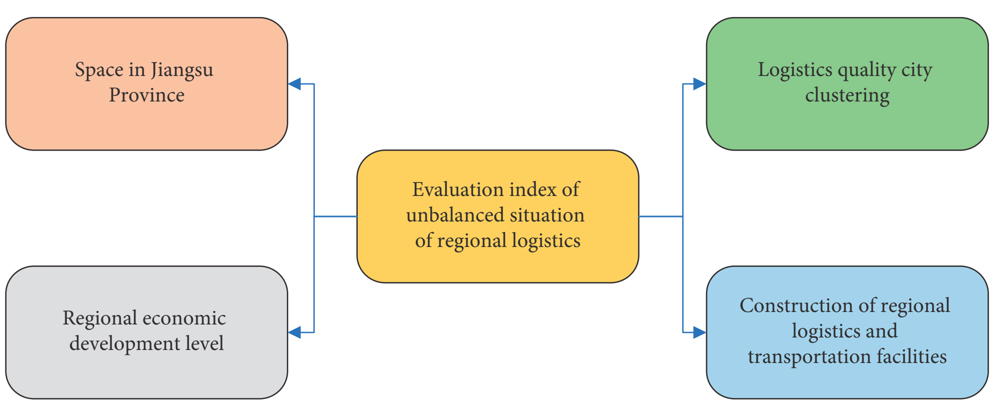

FIGURE 9: Evaluation indicators of the nonequilibrium situation of Jiangsu regional logistics space.

infrastructure construction index is the embodiment of the development status and potential of the regional logistics industry and is an important basic support for the flow of goods in the regional logistics spatial pattern [26]. Regional logistics quality, regional economy, transportation, warehousing, etc. are indicators for evaluating comprehensive strength.

The selection of indicators is completed through the gravity model, which is a space interaction model, derived from Newton's law of universal gravitation. In other words, the gravity between two objects is proportional to its mass and inversely proportional to the distance. Later, by establishing a relatively complete and simple economic application to predict the ability of spatial interaction in the field of economics, the theory is further developed and extended. In recent years, many scholars have successfully confirmed empirical research on trade exchanges, population migration, spatial distribution, and other aspects. This article draws on the core idea of the gravity model, constructs the urban gravity model of regional logistics in 13 cities in Jiangsu from two aspects of urban logistics “quality” and inter-city logistics distance, and selects indicators.

According to the constructed “quality” evaluation index of Jiangsu urban logistics, the weight and information entropy of the three first-level indexes of the entropy weight calculation method are used, and the ranking is carried out. The indicators of the regional economic development level, regional logistics supply scale, and regional logistics infrastructure construction of 13 cities in Jiangsu province are derived using the formula of the seventh step of the entropy weight method. In this experiment, the amount of information on each indicator is used to determine the weight of each indicator [27]. In order to avoid the interference of other factors, the model does not select 13 prefecture-level cities but only three representative regions in Jiangsu and conducts normalized data processing and standardized processing on the indicators one by one [28]. When the entropy weight calculation method is used to normalize and standardize the indicators' data, the calculations are often used, as shown in (5) and (6):

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^{3} x_{ij}}, \quad (5)$$

$$e_j = -k \sum_{i-1}^{3} P_{ij} \ln\left(P_{ij}\right), \quad (6)$$

where P_{ij} is the probability of the ith city node appearing and e_j is the entropy value of the indicator.

$$\begin{aligned} d_j &= 1 - e_j, \\ w_j &= \frac{d_j}{\sum_{j=1}^{4} d_j}, \\ s_i &= \sum_{j=1}^{4} w_j \cdot P_{ij}. \end{aligned} \quad (7)$$

d_j is the information entropy redundancy, w_j is the weight value of each indicator, and s_i is the composite score for each city.

The logistics interaction force between the two cities can be judged through calculation. However, the formation of the regional logistics pattern in Jiangsu is not comprehensive only by determining the pivot and pivot cities. It is also necessary to analyze the influence scope of the logistics between the pivot cities. Therefore, combined with the calculation results of the inter-city logistics gravity measurement and cluster analysis, the logistics membership function is used to determine further the radiation range of its axis city logistics activities.

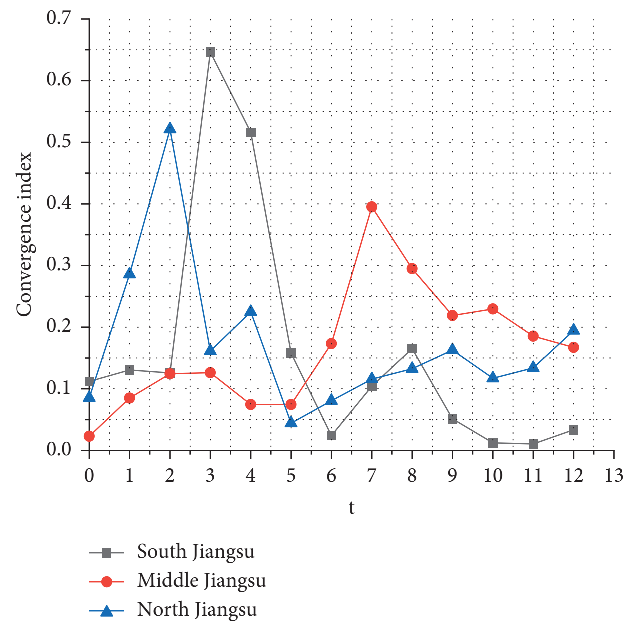

Figure 10: Convergence index and trend of the nonequilibrium situation of regional logistics space in Jiangsu.

3. Analysis of Experimental Results

Convergence effect results of the nonequilibrium situation assessment model: the nonequilibrium evolution process of Jiangsu regional logistics space is analyzed. In the discrete degree of nonsituational development of logistics space in Jiangsu Province and the three major regions, the convergence index represents the standard deviation of the logarithm. t refers to the passage of time. If the convergence index value tends to decrease with the passage of time, it means that there is convergence in the nonequilibrium of regional logistics space in Jiangsu. Otherwise, it diverges. The convergence index and trend of the nonequilibrium situation of the Jiangsu regional logistics space are shown in Figure 10.

In Figure 10, the logistics space in the three major regions is in a state of unbalanced development. In the early stage, the unbalanced situation of regional logistics space in Jiangsu changed from divergence to convergence, but the fluctuation range is obvious and some fluctuations were very large. Both the southern Jiangsu region and the northern Jiangsu region showed a trend of rapid rise and then declined, and the central Jiangsu region is more moderate. In the midterm, the nonequilibrium situation of regional logistics space in Jiangsu has changed from divergence to convergence, and the southern and central Jiangsu regions have shown a trend of rapid rise and then decline. The fluctuation range of the northern Jiangsu is relatively flat, showing a trend of convergence. In the later period, the convergence index of the central Jiangsu region showed a divergent trend from weak fluctuations and then began to converge, and the overall performance is stable. To sum up, there is no convergence effect due to the nonequilibrium of regional logistics space in Jiangsu. Northern Jiangsu has the

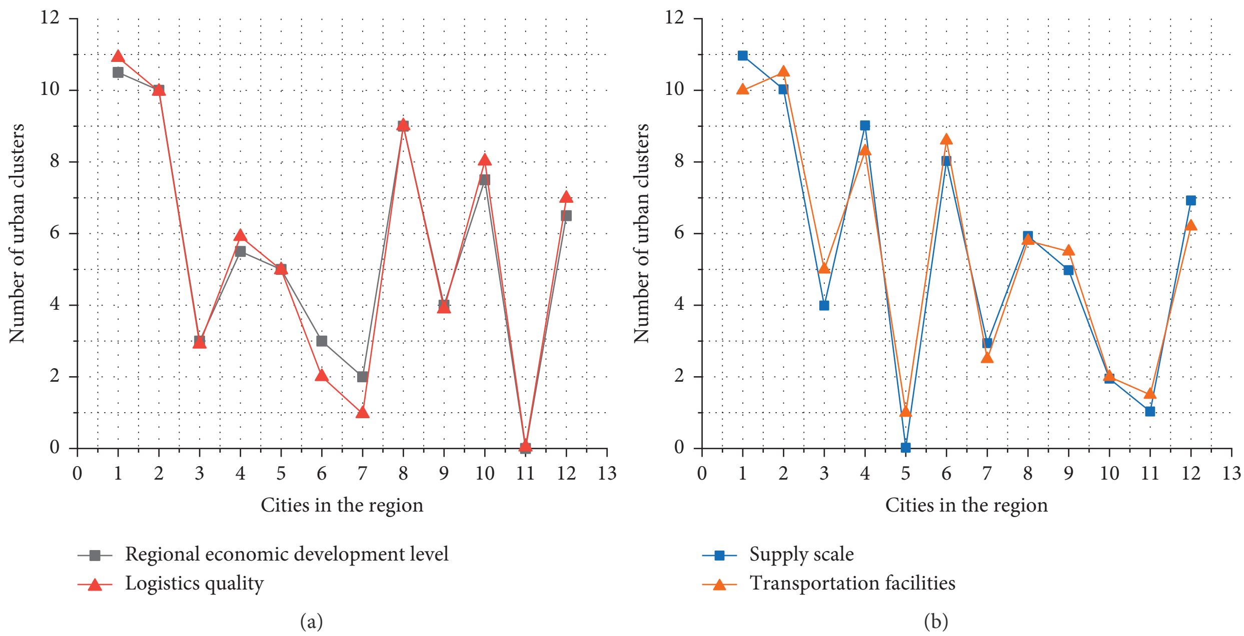

Figure 11: Results of cluster analysis of Jiangsu regional logistics spatial disequilibrium model: (a) economic development level and logistics quality; (b) supply scale and construction of transportation facilities.

fastest divergence speed, followed by the central Jiangsu. The unbalanced situation of the overall regional logistics space is obvious in Jiangsu.

Analysis of the evaluation experiments of various indicators of the nonequilibrium situation in logistics space: through the experiment of the nonequilibrium situation convergence index, various indicators of Jiangsu regional logistics space nonequilibrium situation are further evaluated and tested. That is, each index belonging to different regions is subjected to cluster analysis. Cluster analysis is an important display form of regional disequilibrium in logistics space. The experiment passed 12 cities in the three regions, numbered 1–12, corresponding Suzhou, Nanjing, Yangzhou, Yancheng, Suqian, Taizhou, Zhenjiang, Huaian, Wuxi, Lianyungang, Xuzhou, and Nantong. These regions are used as independent variables for each region to be clustered. The dependent variable is the number of clusters. The experimental results of the cluster analysis of this model are shown in Figure 11.

In Figures 11(a) and 11(b), the experimental results of each index show the characteristics of nonequilibrium. In Figure 11(a), the uneven data on the level of economic development and logistics quality indicate that the vitality of logistics development in each region is uneven, the flow of logistics items in the region is uneven, and the development status and potential of the regional logistics industry are uneven. In Figure 11(b), the unbalanced number of clusters in the supply scale and the construction of transportation facilities indicates that the logistics in each region is not balanced with the development of the economy, and the trend of modernization and diversification of logistics activities is uneven. To sum up, the spatial nonequilibrium and steady state of logistics development in the three major regions of Jiangsu province are different, but the nonequilibrium trend is basically the same. This will inevitably become the core restricting factor for the coordinated development of Jiangsu's overall logistics. The core element of regional logistics development is the central nervous system of the entire regional logistics operation and is an important force to promote the growth of regional logistics. The imbalance of logistics productivity in various regions of Jiangsu will inevitably lead to the unbalanced situation of regional logistics space in Jiangsu, which affects the process of coordinated and healthy development of regional logistics in Jiangsu.

The spatial disequilibrium of regional logistics is the result of the joint action of various objective factors, which have certain historical rationality and an immutable objective side. Regional logistics development should not only respect the objective fact of unbalanced development but also combine with the development law of regional logistics to build an innovative operation mechanism that can promote the unbalanced and coordinated development of regional logistics space. With the coordinated development of Jiangsu's regional economy, the top priority of Jiangsu's regional logistics development at this stage is to speed up the rationalization of the relationship between the government and the logistics market, optimize the rational distribution and layout of regional logistics productivity, and promote the quality change and efficiency of regional logistics development. Changes and power changes activate logistics productivity and better integrate into the integrated development of the Yangtze River Delta region. Additionally, it is a long-term and arduous task to explore and promote the unbalanced and coordinated development of regional logistics in Jiangsu. It is also a very challenging yet innovative practice.

4. Conclusion

At present, the economic development of Jiangsu province is still in a period of important strategic opportunities, while the opportunities and challenges faced by the development of the logistics industry in Jiangsu have new changes. There are still some problems in the development scale and development level of the logistics industry in Jiangsu due to the imbalance of regional economic development, resource status, development location, and logistics distribution. Dedicated lines dominate the southern Jiangsu, the northern Jiangsu is dominated by stowage, and logistics parking lots are developed in the southern Jiangsu. The regional and unbalanced characteristics of logistics development in the three major regions are obvious. Firstly, the related theories of regional logistics and spatial nonequilibrium situation are deeply excavated to evaluate the spatial nonequilibrium situation of regional logistics in Jiangsu. The classification of regional logistics and spatial nonequilibrium and the levels involved are further based on the current development status of Jiangsu logistics. The main reasons for the spatial nonequilibrium situation of Jiangsu regional logistics are locked. Secondly, the basic principles, application scope, and application methods of Bagging and Boosting algorithms are, respectively, studied. Then, the Jiangsu logistics space nonequilibrium situation evaluation model is established based on the Bagging and Boosting algorithms. The input data is sorted and summarized. Finally, by analyzing and summarizing the results obtained from the experiments of the evaluation model, the core issues of the unbalanced situation of the regional logistics in Jiangsu and the factors that affect the coordinated and healthy development of regional logistics are obtained. The uneven development trend of regional logistics space in Jiangsu has been comprehensively evaluated. The inherent root causes and effects of regional logistics space disequilibrium are of great significance, which can promote the coordination, coordination, and common development of the Jiangsu logistics regions. The research indicators selected in this paper may need to be further supplemented, and the selection method of indicators needs to be further improved. The basis for the selection of indicators needs to be further clarified to have a deeper understanding and better grasp of the complexity and laws of the unbalanced situation of regional logistics space. It needs to be expanded and deepened in future research. The problem of unbalanced development of regional logistics is analyzed and recognized from multiple perspectives. The nonequilibrium concept system of regional logistics development is further constructed. This system can enrich and develop the theoretical framework of non-equilibrium research. Additionally, new spatial analysis technologies and the integration of more spatial data processing methods have been introduced and have made breakthroughs. This is more inclined to applied research, enhances the explanatory power of the uneven development of regional logistics space, and supports promoting the healthy, coordinated, and sustainable development of the entire regional logistics industry.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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References

[1] C. A. Martellucci, R. Sah, A. A. Rabaan, and K. C. K. T. A. D. A. Y. Z. N. M. A. T. A. J. Dhama, “Changes in the spatial distribution of COVID-19 incidence in Italy using GIS-based maps,” *Annals of Clinical Microbiology and Antimicrobials*, vol. 19, no. 1, p. 30, 2020.

[2] D. A. Griffith, Y. Chun, and M. Lee, “Deeper spatial statistical insights into small geographic area data uncertainty,” *International Journal of Environmental Research and Public Health*, vol. 18, no. 1, p. 231, 2020.

[3] C. Yang and S. Liu, “Spatial correlation analysis of low-carbon innovation: a case study of manufacturing patents in China,” *Journal of Cleaner Production*, vol. 273, no. 3, Article ID 122893, 2020.

[4] S. Neves Duarte, B. Cortes de Souza, P. Machado de Almeida, and L. P. Ramos de Araujo, “A compensation strategy based on consumer’s voltage unbalance assessment for a distribution static synchronous compensator,” *IEEE Latin America Transactions*, vol. 18, no. 01, pp. 156–164, 2020.

[5] A. K. Bharati and V. Ajjarapu, “Investigation of relevant distribution system representation with DG for voltage stability margin assessment,” *2020 IEEE Power & Energy Society General Meeting (PESGM)*, vol. 35, no. 3, pp. 2072–2081, 2020.

[6] S. Cai and J. Zhang, “Exploration of credit risk of P2P platform based on data mining technology,” *Journal of Computational and Applied Mathematics*, vol. 372, no. 1, Article ID 112718, 2020.

[7] C. Lou, J. Yang, T. Li, and E. Vega Fuentes, “New phase-changing soft open point and impacts on optimising unbalanced power distribution networks,” *IET Generation, Transmission & Distribution*, vol. 14, no. 23, pp. 5685–5696, 2020.

[8] Z. Zhu, A. Xu, Q.-C. He, and H. Yang, “Competition between the transportation network company and the government with subsidies to public transit riders,” *Transportation Research Part E: Logistics and Transportation Review*, vol. 152, no. 5, Article ID 102426, 2021.

[9] K. Govindan and H. Gholizadeh, “Robust network design for sustainable-resilient reverse logistics network using big data: a case study of end-of-life vehicles,” *Transportation Research*

Part E: Logistics and Transportation Review, vol. 149, no. 1, Article ID 102279, 2021.

[10] S. Michael, M. Papoutsidakis, and G. Priniotakis, "Improvements of city logistics methods in thriasio area, Greece," *Open Journal of Applied Sciences*, vol. 10, no. 12, pp. 767–778, 2020.

[11] J. You and H. Chen, "A study on establishing a cross-border E-commerce logistics system for agricultural products in sichuan province in the context of the belt and road initiative," *Contemporary Social Sciences*, vol. 6, no. 5, p. 16, 2021.

[12] M. K. Othman, N. S. F. Abdul Rahman, A. Ismail, and A. H. Saharuddin, "Factors contributing to the imbalances of cargo flows in Malaysia large-scale minor ports using a fuzzy analytical hierarchy process (FAHP) approach," *The Asian Journal of Shipping and Logistics*, vol. 36, no. 3, pp. 113–126, 2020.

[13] N. Banyanan, "Optimization of E-commerce logistics network in african countries," *Proceedings of Business and Economic Studies*, vol. 4, no. 3, pp. 91–99, 2021.

[14] G. Yi and G. Yang, "Research on the tripartite evolutionary game of public participation in the facility location of hazardous materials logistics from the perspective of NIMBY events," *Sustainable Cities and Society*, vol. 72, no. 5, Article ID 103017, 2021.

[15] H. Fu, H. Li, and W. Fu, "Research on optimization of anyang logistics industry development," *International Journal of Social Science and Education Research*, vol. 3, no. 4, pp. 69–76, 2020.

[16] Q. Z. Qu and S. Han, "Research on current situation, problems and countermeasures of marine logistics talent training in the postepidemic era," *Meteorological & Environmental Research*, vol. 12, no. 2, p. 4, 2021.

[17] H. Fu, Y. Zhang, J. Chen, and B. G. P. Zhou, "Tmub1 suppresses hepatocellular carcinoma by promoting the ubiquitination of ΔNp63 isoforms," *Molecular Therapy-Oncolytics*, vol. 18, no. 4, pp. 126–136, 2020.

[18] F. Matloob, T. M. Ghazal, N. Taleb, and S. M. M. A. S. T. R. Aftab, "Software defect prediction using ensemble learning: a systematic literature review," *IEEE Access*, vol. 9, no. 2021, pp. 98754–98771, 2021.

[19] S. Ayvaz and K. Alpay, "Predictive maintenance system for production lines in manufacturing: a machine learning approach using IoT data in real-time," *Expert Systems with Applications*, vol. 173, no. 6, Article ID 114598, 2021.

[20] Q.-V. Vu, V.-H. Truong, and H.-T. Thai, "Machine learning-based prediction of CFST columns using gradient tree boosting algorithm," *Composite Structures*, vol. 259, no. 4, Article ID 113505, 2021.

[21] H. R. Kadkhodaei, A. M. E. Moghadam, and M. Dehghan, "HBoost: a heterogeneous ensemble classifier based on the Boosting method and entropy measurement," *Expert Systems with Applications*, vol. 157, no. 2, Article ID 113482, 2020.

[22] H. Zhang, Y. Li, Z. Lv, and A. K. T. Sangaiah, "A real-time and ubiquitous network attack detection based on deep belief network and support vector machine," *IEEE/CAA Journal of Automatica Sinica*, vol. 7, no. 3, pp. 790–799, 2020.

[23] K. R. Arouri and C. van Dijk, "Mapping solid reservoir bitumen by deconvoluting formation mechanism," *Journal of Petroleum Science and Engineering*, vol. 205, no. 11, Article ID 108893, 2021.

[24] M. Leila, S. Sen, M. Abioui, and A. Moscariello, "Investigation of pore pressure, in-situ stress state and borehole stability in the West and South Al-Khilala hydrocarbon fields, Nile Delta, Egypt," *Geomechanics and Geophysics for Geo-Energy and Geo-Resources*, vol. 7, no. 3, pp. 56–16, 2021.

[25] J. M. Falligant and G. W. Rooker, "Further analysis of the response deprivation hypothesis: application of the disequilibrium model to novel clinical contexts," *Psychological Record*, vol. 71, no. 2, pp. 307–311, 2021.

[26] J. Yuan, D. Fan, Z. Xue, and J. J. Qu, "Co-expression of mitochondrial genes and ACE2 in cornea involved in COVID-19," *Investigative Opthalmology & Visual Science*, vol. 61, no. 12, p. 13, 2020.

[27] F. Han, D. Wang, and B. Li, "Spillover effects of ports and logistics development on economic power: evidence from the Chinese BTH regions," *Sustainability*, vol. 11, no. 16, p. 4316, 2019.

[28] K. Ge, S. Zou, D. Chen, and X. S. Lu, "Research on the spatial differences and convergence mechanism of urban land use efficiency under the background of regional integration: a case study of the Yangtze River economic zone, China," *Land*, vol. 10, no. 10, p. 1100, 2021.