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ORIGINAL RESEARCH ARTICLE

Research on elastic governance strategy of urban public safety based on entropy weighted discrete clustering method

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ABSTRACT

Currently, there are problems in the governance of urban public safety, such as a single entity, outdated governance concepts, and immature governance technologies. This article combines big data analysis technology and utilizes intelligent emergency mechanisms to conduct in-depth research on governance strategies to enhance the resilience of urban public safety to disasters. This article first integrates big data analysis technologies, such as the Internet of Things and cloud computing, into UPS (urban public safety) and then builds a UPS system based on this. Combining the entropy-weighted dispersion clustering method, evaluate the values of urban public safety indicators. In order to verify the effectiveness of the intelligent emergency mechanism based on big data analysis, this article conducted experimental analysis on it. Under the intelligent emergency mechanism algorithm, the average seismic compliance rate of buildings in various cities has reached 88.57%. The conclusion indicates that an intelligent emergency mechanism based on big data analysis can enhance the adaptability of urban public safety governance strategies, improve the seismic and fire warning monitoring capabilities of urban buildings, reduce the occurrence of traffic accidents, and provide more guarantees for urban fire safety.

Keywords: urban public safety; elastic governance; big data; entropy weighted discrete clustering method; governance strategy

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1. Introduction

The continuous advancement of urbanization and the continuous expansion of the urban population have led to an increasing population density in urban areas, making the UPSG (urban public safety governance) problem more complex. Modern cities face various potential risks, including natural disasters, human risks, and public health threats. These risks require urban public safety governance to be resilient and able to respond to various threats[1] effectively. At present, there are many problems in UPSG, which have brought great difficulties to it, leading to a lower overall level of urban safety governance. With the maturity of computer science theory, big data analysis technology has made great progress and has been widely applied in various professional fields. Big data analysis technology has the characteristics of scale and efficiency in urban public safety governance. However, data technology can detect potential safety hazards and risks in advance through massive data analysis and mining, which can improve the efficiency and level of urban emergency linkage. It has important practical value for improving the construction of urban emergency linkage and enhancing the level of public safety elastic governance strategies.

In order to ensure the normal operation of various urban activities, it is very important to manage urban public safety effectively, and research on urban governance is also very popular. Seijas and Gelders[2] conducted a survey of 35-night mayors and night advocacy organizations from around the world, and the research data showed that although cities had vastly different practices in night infrastructure and regulation, there seemed to be an increasing consensus on the need for permanent night governance structures. The persistent nighttime governance system was challenging conventional urban government techniques. In his exploration of certain important ideas, patterns, and techniques in modern urban governance research, Da Crez et al.[3] comprehensive overview of urban governance was presented, together with recommendations for future research areas, based on a survey of local government personnel and a horizontal scan of recent literature. McGuirk P et al.[4] examined the relevance of COVID-19 for innovative urban governance and the pivotal role that urban response to the pandemic played, drawing from both Australian and global instances. In addition to taking into account the benefits and hazards presented by COVID-19's pursuit of inclusive innovation in the area of urban governance, he also took into account the aroused management mechanism. However, these scholars' research on urban governance security is not comprehensive enough. In a smart city environment, research on urban governance can achieve good results.

In the new era, smart cities are gradually emerging, and there are corresponding reports on research on urban governance in the smart city environment. Meijer A[5] elaborated on smart cities from the perspective of public governance, emphasizing how to understand the construction of smart cities from the perspectives of "participants", "rules", and "games" in urban governance. The results of the theoretical analysis identified three types of actors, three governance challenges, and five governance games. The governance of smart cities was redefined as the social and technological structure that appears in the governance game. Peyvandi A et al.[6] proposed an independent biomedical waste management framework to address the issue of garbage masks in smart city governance. This framework used edge monitoring and location intelligence to detect discarded masks and predicted and modeled emergency responses to this problem. A location intelligence model was constructed to predict areas with a high probability of hazardous waste occurrence in smart cities. The experimental results showed that the accuracy of the model in detecting garbage masks in various environments reached 96%, and the processing speed was 10 times faster than similar models. Ju J et al.[7] proposed a framework for citizen-centered big data analysis to promote smart city governance intelligence from two aspects: urban governance issues and data analysis algorithms. Through a case study of blood donation governance in China, he validated the effectiveness of the framework and highlighted the value of citizen-centered big data. Nica E[8] aimed to evaluate and analyze urban big data analysis and sustainable urban governance networks in integrated smart city planning and management. He collected and analyzed massive amounts of data by integrating sustainable urban technology into smart cities that supported the Internet of Things. Integrated intelligent urban planning and management, networked urbanization of computing, and cloud computing technologies could help configure sustainable urban governance networks. Overall, in the context of smart cities, research on urban governance is not comprehensive enough. In order to further improve this research, this article would integrate smart technology and conduct relevant research on urban public safety resilience governance from a resilience perspective.

In order to solve many problems in the current UPSG, this article combined smart technology to conduct relevant research on UPSG. This article applied smart technology to UPSG, aiming to improve the efficiency and level of urban safety governance. It also combined the entropy weight dispersion clustering method to evaluate and test urban public safety from several aspects: building seismic compliance rate, fire warning coverage rate, safety facility compliance rate, and traffic accident occurrence rate. Under the entropy weight dispersion clustering method, the seismic resistance of urban buildings was significantly improved, and the incidence of traffic accidents also significantly decreased. It could be seen that the entropy weight dispersion clustering method could effectively evaluate urban public safety issues and provide effective guarantees for UPSG. Using the weighted dispersion clustering method weights each indicator, divides cities or regions into different categories or clusters, and identifies common features and differences of cities or regions in different categories or clusters, which helps to understand the overall situation and problem distribution of urban public safety. The entropy-weighted dispersion clustering method allows for taking into account the weights of different indicators to reflect their relative importance. This helps to evaluate urban public safety more accurately, as different indicators may have different degrees of impact. Through analysis of building earthquake resistance testing, fire alarm coverage testing, safety facility compliance testing, and traffic accident occurrence testing, the algorithm used in the article was compared with deep learning algorithms and fuzzy neural networks. The entropy weight deviation clustering method combines multiple indicator weight allocation, information entropy calculation, and deviation clustering algorithm, which can effectively improve the effectiveness of urban public safety elastic governance.

2. Urban public safety governance methods

2.1. UPSG and resilient city construction

Urban public security refers to ensuring the safety of life and property of urban residents, stabilizing social order, and promoting the healthy operation of urban economic and social systems within the city. Flexible construction can help cities reduce the impact of various risks, including natural disasters, terrorist attacks, health emergencies, and so on. This will help reduce the loss of life and property and maintain the infrastructure and economic stability of the city.

2.1.1. Urban public safety governance

UPSG refers to the scientific planning, effective organization, and reasonable control of urban public safety issues through laws and regulations, administration, education, and other means in collaboration with citizens, enterprises, social organizations, and other entities under the leadership of the government[9]. By carrying out UPSG activities, the personal safety, health safety, and property safety of urban residents are guaranteed.

The UPSG consists of the following elements: urban natural disasters are primarily defined as a range of catastrophic catastrophes brought on by natural phenomena, including biological, geological, meteorological, drought, and flood disasters. Urban accident catastrophes are primarily defined as those that occur due to a variety of human circumstances. Public health incidents, such as those involving food safety, animal illnesses, and different infectious diseases, pose a major risk to the lives and health of city dwellers. Urban security events, group conflicts, economic crimes, etc., are the primary categories of social security occurrences.

2.1.2. Construction of resilient cities

Resilient cities mainly refer to individuals, institutions, urban systems, etc., in a city that is attacked by sudden events and subjected to long-term pressure and still has good survival, adaptation, and development capabilities. Resilient cities are a combination of prevention and disaster reduction, thus combining conventional and unconventional disaster reduction to cope with various disasters and accidents and minimize disaster risks to ensure the public safety of urban residents. The key to building resilient cities lies in strengthening the resilience of the city itself, which is also a key method for optimizing the resilience of UPSG. Resilient cities are an improved and strengthened version of safe cities and an important channel for promoting UPSG[10].

2.2. Problems in the resilience governance of urban public safety

Nowadays, although a relatively complete system has been established for UPSG, there are still many problems that limit the development of the urban public safety system.

(1) The concept of UPSG is outdated.

At present, the concept of UPSG is relatively backward, and the thinking of materiality and control is very prominent, which clearly goes against the concept of emphasizing both resilient cities and social factors. The traditional UPSG focuses on disaster response, lacking sufficient awareness and attention to various safety concepts. It emphasizes more on the construction of material aspects and does not pay enough attention to the construction of social aspects. UPSG is actually a complex social system engineering, which includes many interrelated factors. To achieve modern UPSG, it is not only necessary to focus on material construction but also on institutional construction at the social level, both of which are indispensable.

(2) The governance subject is single, and social participation is insufficient.

The main body of UPSG is relatively single, and the participation of social groups is not strong. Under the construction of resilient cities, the diversification of subjects is advocated, and great importance is attached to the participation of social forces in UPSG[11]. The theory of resilient cities believes that the occurrence of urban public safety events is influenced by multiple factors, with strong complexity and difficulty in controlling. In addition, cities are densely populated, with high internal factor risks, and relying solely on government power makes it difficult to manage urban public safety issues effectively. The government's ability to govern urban public safety is limited, and relying solely on the government's efforts makes it difficult to govern urban public safety effectively. The main body of UPSG is shown in **Figure 1**.

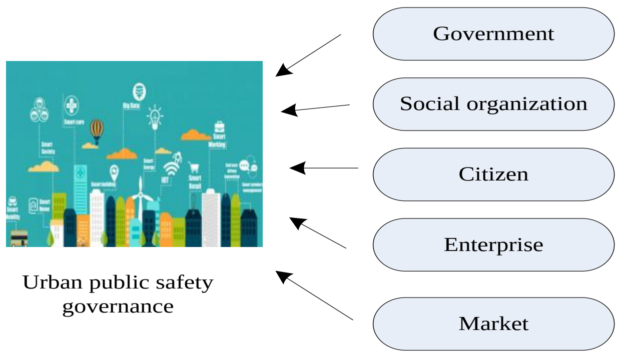

Figure 1. The main body of UPSG.

(3) Governance technology is immature.

Applying smart technology to UPSG can significantly improve the analysis ability and efficiency of risk monitoring in cities and reduce urban disaster risks. The current state of urban safety governance is characterized by a relatively low overall level, suboptimal governance efficiency, and immature governance technology. Numerous cities continue to prioritize disaster response and cleanup over anticipating and analyzing unanticipated events. Additionally, many cities lack adequate catastrophe protection systems and have not built related public safety governance platforms and systems using technologies like big data, artificial intelligence, and cloud computing. Sharing risk information and resources during unexpected public safety situations is challenging without a platform for information exchange.

2.3. Big data analysis technology

Big data, also known as massive data, refers to the massive amount of data involved that cannot be extracted, managed, processed, and organized into information that helps urban public management decision-making within a reasonable time through current mainstream software tools. Its main features include:

(1) High reliability: super storage and processing of each bit of data, capable of processing petabytes of data.

(2) High scalability: utilize existing computer clusters for data distribution and processing and easily expand the data to fit thousands of nodes.

(3) High efficiency: big data analysis technology can achieve dynamic migration of data between different nodes, ensure dynamic balance between nodes, and improve computational efficiency in a parallel manner.

(4) Has high fault tolerance: big data analysis technology can achieve automatic backup of multiple data copies and automatic reconfiguration of tasks that are not successful.

2.4. Urban public safety evaluation based on entropy weight dispersion clustering method

The entropy weight discrete clustering method is a multi-index comprehensive evaluation method, which is used to comprehensively consider multiple indicators or attributes to evaluate the public safety situation and flexible governance strategy of the city. This method is put forward to solve the problem of urban public security governance, with the aim of providing a more comprehensive perspective better to understand the urban security situation and flexible governance strategies.

With the continuous advancement of urbanization, the size of the urban population is continuously expanding, with high population density and a more complex structure, which also brings many challenges to UPSG[12]. The issue of urban public safety has always been important in urban governance, and UPSG is a comprehensive issue that involves complex influencing factors. Therefore, it is necessary to evaluate urban public safety effectively. This article combined the entropy weight dispersion clustering method to conduct relevant research on the evaluation of urban public safety.

The entropy weight decentralized clustering method is used to analyze urban public safety. First of all, it is necessary to collect and sort out the data related to urban public safety. To determine the importance or weight of each index and the data vector of each city, it is necessary to calculate the information entropy of each index. The calculated information entropy values are combined into an information entropy matrix, and the similarity measure between cities is calculated to determine their similarity on different indicators. The deviation matrix between cities is calculated by using the similarity measure, and finally, cities are clustered to divide cities with similar characteristics into the same cluster.

2.4.1. Urban public safety evaluation algorithm

The city set of the urban public safety evaluation model is $R = \{r_1, r_2, \cdots, r_a\}$, so the set of urban safety indicators is $T = \{t_1, t_2, \cdots, t_b\}$.

The indicator set of safety indicator set t_i corresponding to city set r_j is denoted as q_{ji}, and the evaluation matrix is calculated as follows:

$$Q = \left(q_{ji}\right)_{a \times b} \tag{1}$$

Among them, q_{ji} represents the ith safety indicator factor for the j-th city; a represents the total number of cities; b represents the total number of safety indicators.

2.4.2. Entropy weight method

When evaluating urban public safety, the accuracy and reliability of the evaluation can be measured by the quantity and quality of information. The entropy weight method, as a commonly used evaluation method, can effectively evaluate urban public safety.

An attribute matrix is constructed from q_{ji} and standardized. The processed attribute matrix representation is shown as follows:

$$W = (e_{ji})_{ab} \tag{2}$$

Among them, e_{ji} represents the weight value of urban safety evaluation indicators.

By analyzing the definition of entropy, the entropy values of public safety evaluation indicators for each city can be obtained, which are expressed by the formulas as follows:

$$y_i = -\frac{1}{\ln a}\sum_{j=1}^{a} u_{ji}\ln u_{ji} \tag{3}$$

$$u_{ji} = \frac{(1 + e_{ji})}{\sum_{j=1}^{a}(1 - e_{ji})}, 0 \le y_i \le 1 \tag{4}$$

The coefficient of difference for the i-th safety indicator can be expressed as follows:

$$s_i = 1 - y_i, i = 1, 2, \cdots, b \tag{5}$$

The weight vector of urban public safety evaluation indicators is $\delta = \{\delta_1, \delta_2, \cdots, \delta_b\}$. Among them, δ_i is represented by the formula as follows:

$$\delta_i = \frac{s_i}{\sum_{i=1}^{b} s_i}, i = 1, 2, \cdots, b \tag{6}$$

2.4.3. Maximizing dispersion method

With the help of the maximum deviation method, the corresponding indicator weights can be determined based on the degree of dispersion of urban public safety indicator values.

For e_{ji}, $P_{ji}(\alpha)$ is used to define the weights of urban public safety indicators. The formula is as follows:

$$P_{ji}(\alpha) = \sum_{j=1}^{a} \left|e_{ji}\alpha_i - e_{di}\alpha_i\right|, j \in a, i \in b \tag{7}$$

According to the principle of maximizing deviation, for the selection of α, in order to ensure that the total deviation of all attributes from all targets is maximized, an objective function needs to be established, and the formula is expressed as follows:

$$F(\alpha) = \sum_{i=1}^{b} P_i(\alpha) = \sum_{i=1}^{b}\sum_{j=1}^{a}\sum_{d=1}^{a} \left|e_{ji} - e_{di}\right| \alpha_i \tag{8}$$

In order to raise the general standard of urban public safety resilience governance, efficient and more scientific evaluation of urban public safety can be carried out using the entropy weight technique and the maximum deviation method. Building a smart emergency-focused UPSG system requires combining pertinent smart technologies in order to better optimise UPSG difficulties.

2.5. Intelligent emergency management system for urban public safety

2.5.1. Overall framework of UPSG system

In a smart emergency environment, the construction of UPSG system also requires the classification and organization of public safety governance matters, which can be managed from both horizontal and vertical levels[13].

(1) Horizontal governance of urban public safety:

The construction of the UPSG system requires high attention to sudden public safety incidents in the city. In the normalized process of urban safety governance, smart emergency management methods should also be integrated to improve the level of urban safety warning. Overall, it is necessary to have both a normalized UPSG plan and a public safety emergency management plan.

(2) Vertical governance of urban public safety:

The emergency management process for urban public safety is shown in **Figure 2**, which mainly includes several parts before, during, and after the event. In the process of safety emergency management, it is necessary to check every link, do a good job of pre monitoring and early warning, and try to control the occurrence of various events from the source as much as possible. Rescue work should be done well during the incident, with all parties working together and coordinating actions to minimize accident losses as much as possible. Afterwards, it mainly evaluates the pre prevention and rescue work during the incident.

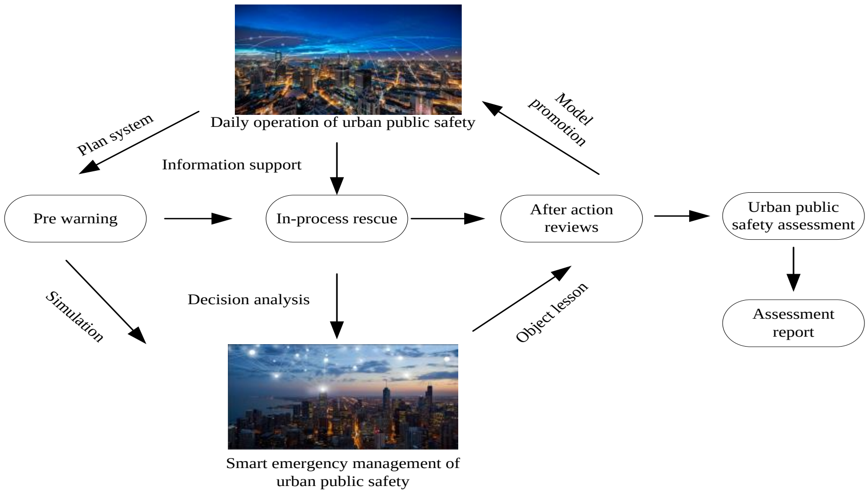

Figure 2. Smart emergency management process for urban public safety.

2.5.2. Technical application of UPSG system

With the expansion of urban scale, human and material resources are also relatively scarce, making it more difficult to implement multi-functional, multi-level, and large-scale safety monitoring for cities. With IoT technology's assistance, UPSG would no longer be challenging. Multi-dimensional perception, highly dependable information transmission, and sophisticated processing are features of the Internet of Things. It can effectively make up for the flaws and weaknesses of conventional public security governance by monitoring the seen objects intelligently without the need for human interaction.

Currently, there is a lack of overall awareness in urban public safety emergency management. With the help of the Internet and information technology, the flow of information has become more smooth, thus promoting the sharing and dissemination of information, and strengthening the links between the various entities. When a safety incident occurs, all parties can also promptly understand the situation of the incident and participate in rescue work in a timely manner.

Emergency management of urban public safety requires data support. With the help of the smart city cloud computing management platform, effective data collection, analysis and processing can be achieved[14]. Through the Internet of Things technology, valuable information can be transmitted to the platform, and the collected information can be organized and summarized into a database. With the help of cloud computing technology, data can be fully mined, analyzed, and organized, and given the function of predicting and warning data.

3. Urban public safety evaluation and testing

Urban public safety governance can cover many fields, including natural disaster management, urban planning, emergency response, traffic safety, crime prevention and so on. This paper focuses on building earthquake resistance, fire coverage, safety facilities and traffic accidents. In order to verify the effectiveness of the entropy weight dispersion clustering method in evaluating urban public safety, this article selected six cities in China as the research objects, and combined with the entropy weight dispersion clustering method, conducted public safety evaluation tests on these cities from multiple aspects. In addition, comparative experiments were conducted with the other two methods. The experimental results are shown below.

3.1. Testing of building seismic compliance rate

Earthquake disaster would bring serious impact on urban public safety and endanger human life safety. In order to better respond to earthquake disaster, urban buildings need to have good seismic capacity. The higher the seismic compliance rate of buildings, the stronger the seismic capacity of urban buildings. This article used different algorithms to conduct testing experiments on the seismic compliance rate of buildings in various cities, and the test results are shown in **Figure 3**.

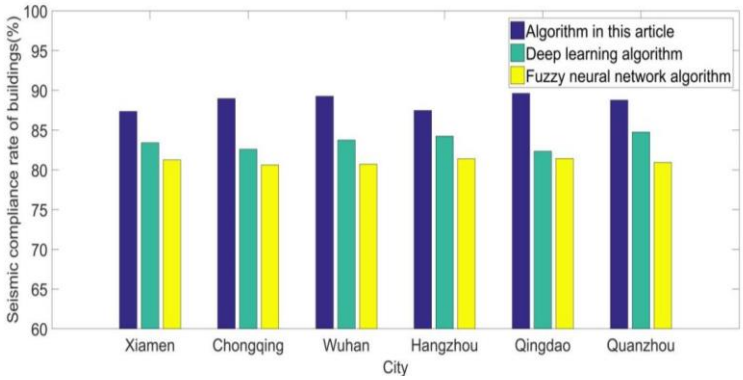

Figure 3. Testing of seismic compliance rate of urban buildings under different algorithms.

From the data in **Figure 3**, it could be seen that under the algorithm in this article, the seismic compliance rate of buildings in various cities was relatively high, basically maintaining above 85%. Among them, the seismic compliance rate of buildings in Qingdao was the highest, reaching 89.62%. The seismic compliance rate of buildings in Xiamen was the lowest, which was 87.35%. The average seismic compliance rate of buildings in various cities reached 88.57%. Under the deep learning algorithm, the overall seismic compliance rate of buildings in various cities was relatively low, which was controlled below 85%. Among them, Quanzhou city had the highest seismic compliance rate of 84.75%. The seismic compliance rate of buildings in Qingdao was the lowest, which was only 82.34%. The average seismic compliance rate of buildings in each city was 83.51%. Under the fuzzy neural network algorithm, the seismic compliance rate of buildings in various cities was significantly lower. Among them, the seismic compliance rate of buildings in Chongqing was the lowest, which was only 80.62%. The seismic compliance rate of buildings in Qingdao was the highest, which was 81.42%. The average seismic compliance rate of buildings in each city was 81.05%. From the above data, it could be seen that under the algorithm in this article, the seismic compliance rate of buildings in each city was higher, indicating that this algorithm could effectively improve the seismic capacity of urban buildings and provide good guarantees for urban public safety.

The average seismic compliance rate of buildings reaches 88.57%: This indicates that urban buildings perform well in seismic resistance, with most buildings meeting seismic requirements, improving the safety of urban residents during earthquakes.

3.2. Fire warning coverage testing

The occurrence of fire accidents would pose a certain threat to urban public safety and also have a destructive impact on humanity, thus causing casualties. Enhancing early warning and fire accident monitoring is also essential to lower the losses resulting from fire incidents. Ensuring urban public safety becomes easier the higher the coverage rate of early warning and monitoring systems for fires. This article also carried out an experimental analysis on the coverage of fire warning monitoring in different cities, as indicated in **Figure 4**, in order to further examine the variations in the evaluation of urban public safety using different algorithms.

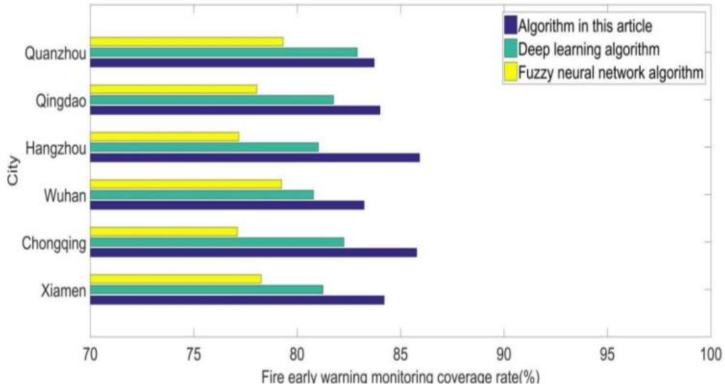

Figure 4. Testing of the coverage rate of urban fire warning coverage monitoring under different algorithms.

From the data in **Figure 4**, it could be seen that under the algorithm proposed in this paper, the fire warning and monitoring coverage rate in Hangzhou was the highest, reaching 85.92%. Wuhan city was the lowest, which was 83.24%. The average fire warning and monitoring coverage rate of each city reached 84.48%. Under the deep learning algorithm, the coverage rate of fire warning and monitoring in Wuhan city was the lowest, which was only 80.79%. Quanzhou city was the highest at 82.91%. The average fire warning and monitoring coverage rate of each city was 81.67%. Under the fuzzy neural network algorithm, the coverage rate of fire warning and monitoring in each city would be lower. Among them, Chongqing had the lowest coverage rate of fire warning and monitoring, which was only 77.12%. Quanzhou city was the highest at 79.32%. The average fire warning and monitoring coverage rate of each city was 78.20%. In summary, this algorithm could effectively improve the coverage of fire warning and monitoring in various cities, thus providing strong guarantees for urban public safety.

The coverage rate of fire alarm and monitoring reached 84.48%, indicating that the city has a relatively high coverage rate of fire alarm and monitoring systems. This is crucial for early detection and intervention of fires, helping to reduce losses caused by fires.

3.3. Compliance rate of safety facilities

In order to provide diverse public services to urban residents, many public places have built certain infrastructure for their use. In order to ensure urban public safety, it is necessary to strengthen the construction of safety facilities to meet the safety standards for facility use. The higher the compliance rate of safety facilities, the higher their safety. This article also used different algorithms to conduct safety facility compliance testing experiments on various cities, and the test results are shown in **Figure 5**.

From the data in **Figure 5**, it could be seen that under the algorithm in this article, the overall compliance rate of safety facilities in each city was relatively high. Among them, Quanzhou had the highest compliance rate of 88.99%, while Chongqing had the lowest compliance rate of 85.39%. In every city, the average compliance percentage for safety facilities was 87.37%. The safety facility compliance rate, which was essentially capped at 80%, would have been slightly lower under the deep learning system in different cities. With a percentage of 78.13%, Hangzhou had the lowest safety facility compliance among them, while Chongqing had the highest, at 81.27%. In every city, the average compliance percentage for safety facilities was 79.97%. The compliance rate of safety facilities in every city would be lower under the fuzzy neural network algorithm than it was under the test findings of the first two algorithms. Out of all of them, Wuhan had the greatest safety facility compliance rating at 76.28%, while Hangzhou had the lowest at 73.47%. In every city, the average compliance percentage for safety facilities was 74.82%. The aforementioned data indicates that the algorithm presented in this article has the potential to enhance both the degree of urban public safety and the compliance rate of safety facilities across different cities.

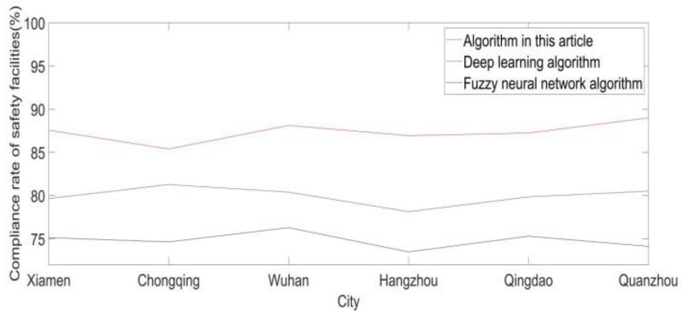

Figure 5. Testing of the compliance rate of urban safety facilities under different algorithms.

3.4. Testing of traffic accident occurrence

Urban areas have a large flow of people and frequent traffic, resulting in frequent traffic accidents. The lower the incidence of traffic accidents in a city, the higher the level of public safety in that city. In order to comprehensively compare the differences between different algorithms, this article added 4 new cities on top of the original 6 cities and conducted statistical tests on the weekly traffic accident occurrence of these 10 cities. The average value of the weekly test was taken as the final result, and the experimental results are shown in **Figure 6**.

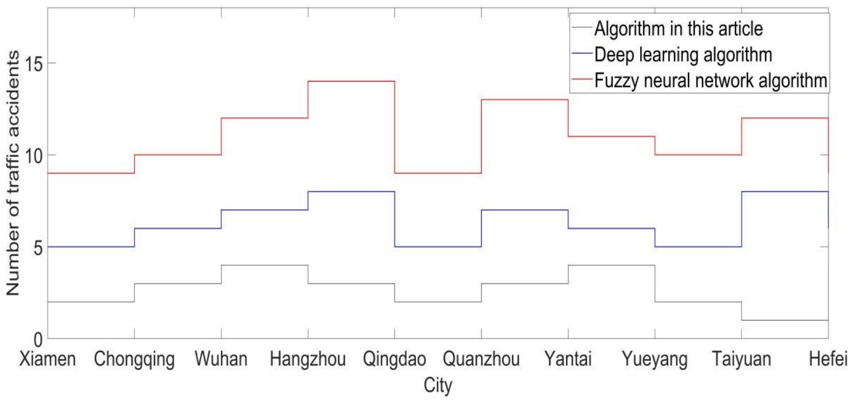

Figure 6. Testing of urban traffic accidents under different algorithms.

From the data in **Figure 6**, it could be seen that under the algorithm proposed in this article, there were relatively few traffic accidents in each city. Among them, Taiyuan had the lowest number of traffic accidents, with only one incident. The number of traffic accidents was highest in Wuhan, Yantai, and Hefei, all reaching 4. Under the deep learning algorithm, the number of traffic accidents in each city would be slightly higher. Among them, Hangzhou and Taiyuan had the highest number of traffic accidents, reaching 8. Xiamen, Qingdao, and Yueyang had the lowest number of traffic accidents, all of which were 5. Under the fuzzy neural network algorithm, the number of traffic accidents in each city would be higher. Among them, Hangzhou had the highest number of traffic accidents, reaching 14. The number of traffic accidents in Xiamen, Qingdao, and Hefei reached the lowest, all with 9 incidents. In summary, the number of urban traffic accidents under this algorithm was lower, indicating that this algorithm could effectively reduce the occurrence of traffic accidents in various cities and help improve the level of UPSG.

In this paper, building earthquake resistance, fire coverage, safety facilities and traffic accidents are analyzed, and four urban safety scenarios are set up, and compared with deep learning and fuzzy neural network. The algorithm applied in this paper has the best elastic governance effect of urban public safety.

4. Governance strategy

The purpose of building a resilient city is to enhance the city's resilience to respond to various emergencies and ensure its safe and stable operation. To improve the resilience of UPSG, it is necessary to start from the following aspects:

(1) Diversified governance entities:

The main body of traditional public safety governance is the government, but the government's ability is limited. In the new situation, it is necessary to fully mobilize the forces of various social entities to participate in public safety governance work together[15]. Diversified entities are the key to urban safety governance. The government departments play their leading role, and other entities participate in public safety governance work together, thus fully leveraging their respective advantages, and forming a joint force of the government, social organizations, and citizens to jointly govern urban public safety issues.

(2) Emphasizing the comprehensiveness of safety governance:

To strengthen urban resilience construction, it is necessary to establish a new public safety concept and always adhere to the perspective of sustainable urban development to view urban safety issues. Under the concept of sustainable urban development, urban development focuses on putting people first, aiming to ensure people's sense of security, happiness, and gain. Specifically, it means breaking the outdated concept of prioritizing property safety and order safety in safety governance, and paying more attention to the physical and mental health of the masses.

To improve urban safety governance, a resilient social mechanism should also be established. With the help of resilient social mechanisms, citizens' learning and adaptation abilities would also be improved, which helps to achieve social self-organization and management. Building a resilient social mechanism also requires the integration of social resources. Through various means, the resilience of communities is strengthened to enhance the city's resilience and resilience to disasters.

(3) Intelligent implementation of security governance:

Strengthening the application of smart technology in urban public safety resilience governance can promote the development of urban safety resilience governance towards intelligence[16,17]. Smart technology may be used to increase the resilience and adaptation of urban safety systems while also enhancing the predictability and timeliness of urban safety resilience governance. To be more precise, big data technology can be utilised to build a dynamic risk database that can be used to track and alert users to possible safety risk events in real time, increasing the degree of urban safety risk management and warning accuracy.

With the help of big data and intelligent network technology, the city's dilapidated infrastructure has been repaired and renovated. With the help of technologies such as big data and the Internet of Things, the city's level of early warning, decision-making, and governance of security risks would also be greatly improved.

5. Conclusions

UPSG has always been a highly valued issue by government departments. With the rapid growth of urban population, there are also many problems in UPSG. This article analyzes the main problems in emergency management of urban emergencies and proposes to apply big data analysis technology and intelligent emergency mechanisms to urban public safety governance to achieve emergency management of urban emergencies. The entropy weight dispersion clustering approach was also integrated in this study to carry out pertinent experimental tests on the assessment of urban public safety. According to the experimental results, the algorithm presented in this study greatly increased the seismic compliance rate of structures, the coverage rate of fire warning and monitoring, the compliance rate of safety facilities, and decreased the number of traffic accidents. This suggested that the algorithm may assess indications linked to urban public safety and raise UPSG's general bar. Accessible data is necessary for big data analysis. The accuracy and dependability of research findings may be impacted by problems with obsolete, erroneous, or incomplete data in some towns or areas. Cities can lessen the effects of a variety of dangers, such as natural catastrophes, terrorist attacks, medical problems, and so forth, by using flexible construction. This will preserve the city's infrastructure and economic stability while also assisting in lowering the number of fatalities and property losses. In future research work, the entropy weight dispersion clustering method needs to continuously adapt to the actual needs of the development of UPSG, and improve the performance of the algorithm, so as to provide more effective assistance for promoting the development of urban public safety resilience governance. In the future, it will ensure that the use of big data in urban public safety governance is safe and in line with privacy regulations.

Author contributions

Writing—review and editing, ND; writing—original draft preparation, ND; supervision, LY. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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