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Article

Analysis of China's intellectual property legal protection strategy based on machine learning algorithms and biomechanical theory

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Abstract: This study aims to analyze the current status and challenges of intellectual property protection in the networked environment from a biomechanical perspective. The research objectives are achieved through literature review, case studies, surveys, the application of risk factor algorithms, and biomechanical analysis. By examining real-world cases and conducting surveys, the study provides an in-depth understanding of the current state and challenges of intellectual property protection. Additionally, a gated recurrent unit (GRU) model is employed to compute the weights of risk factors. Finally, biomechanical analysis is used to evaluate intellectual property risks. Initially, historical intellectual property risk data is collected using the GRU model, relevant risk factors are extracted, and their weights are calculated. Drawing on biomechanical concepts, key variables in risk are analyzed by analogy, where risk is treated as the state variable, risk factors are represented as external forces, and weights denote the magnitude of these forces. A biomechanical model is constructed to analyze the "stress-strain" relationship of risks, thereby uncovering the dynamic interactions between factors and risks from a biomechanical perspective. Ultimately, the study evaluates and predicts future intellectual property risks. manuscript. The results show that within a year, the number of patent infringement, invention infringement, utility model infringement and reprint infringement cases encountered by website creators fluctuates between different quarters. For example, the number of patent infringement cases increased from 52 in the first quarter to 61 in the third quarter, and then decreased to 54 in the fourth quarter; while the number of reprint infringement cases continued to rise, from 78 in the first quarter to 91 in the third quarter, and then decreased slightly to 62 in the fourth quarter. In addition, after strengthening the supervision of intellectual property protection, creators in different occupations have shown an increase in their satisfaction with intellectual property protection, with creators in occupations D and F having the highest satisfaction.

Keywords: internet perspective; intellectual property in China; intellectual property law; Gru; research on legal protection; research on intellectual property issues; biomechanical theory

1. Introduction

Looking at China's Internet intellectual property protection, it is not difficult to see that at the legal level, China has not formulated clear laws to protect intellectual property rights in cyberspace. In fact, the Internet environment is complex, and the legal property rights is also complex, involving many complex elements and contents. Due to the openness of computer networks, the number of incidents of direct copying or uploading of intellectual property rights of many users to the network is huge, the awareness of copyright protection is weak, and the legal awareness of users is insufficient. Due to the unstandardization of laws, the law of intellectual property protection still needs deeper research.

GRU has a wide variety of applications in intellectual property protection, covering infringement detection, evidence collection, content monitoring, and other aspects of multiple content types such as text, images, and audio. Leveraging the temporal modeling capabilities of the GRU model enables the accurate identification of relevant risk factors and the calculation of their associated weights.

Biomechanics typically models the dynamic behavior of objects under external forces, predicting their trajectories and trends, and has been applied to various interdisciplinary research fields such as education, psychology, and finance [1–3]. While biomechanics and intellectual property risk assessment belong to distinct domains, there are underlying connections between them, particularly in system modeling, dynamic analysis, and the understanding and optimization of complex networks. Biomechanics research can complement and advance studies in networks and computational science [4]. By simulating the "stress-strain" patterns observed in biological systems, it becomes possible to analyze more accurately the relationships between risk factors and intellectual property risks.

Under the existing intellectual property legislation, there is no special legislation to protect intellectual property in the Internet environment, which brings difficulties to the protection of intellectual property and the Internet. Hua believed that the platform is an important innovation engine to promote the development of the consumer Internet [5]. Hu believed that the Energy Internet is an emerging discipline with very distinct interdisciplinary characteristics. It needed to be sorted out and summarized in time to provide reference for its future development [6]. Bacsardi et al. focused on one of the barriers to global connectivity and possible solutions to it. Based on these findings, several recommendations are made that take into account the numerous challenges posed by the development of air and space Internet access [7]. Yu et al. pointed out that risk monitoring is the difficulty faced by China's agricultural product supply chain in view of the dominance of traditional models, the diversification of main entities on the chain, and the low status of farmers. He clarified the role of the Internet in agricultural supply chains [8]. In order to fully understand the needs of public opinion and "Internet + social care", a questionnaire survey was conducted according to the research objectives. The study concluded that the public relies on traditional models and knows little about "Internet + social help" according to Huang et al. [9]. Liu and Huang found the Internet to play a leading role [10]. Huang tried to analyze the project from the perspective of the National Natural Science Foundation of China. The results showed that after the Internet has become the power grid and smart grid, the research hotspot of cogeneration of cooling, heating and power. This is also one of the reasons why the current electronic induction research is mainly concentrated in the field of electrical science and engineering [11]. These studies on Internet knowledge are relatively comprehensive, but they do not include intellectual property legal knowledge.

When deal with intellectual property issues, it is necessary not only to pass legal supervision, but also to improve the early warning of intellectual property protection through the construction of civic morality. Based on the latest legislative documents, statistical data, important cases and judicial policies of the Supreme Court of China, Feng and Ma analyzed the provisions on damages in China's Patent Law, Trademark Law and Copyright Law and their application in Chinese courts [12]. According to Lu

et al., if the court, guided by legal policy, has exercised its discretion, the damages would be unreasonably increased [13]. Shaw outlined the meaning of intellectual property and categorizes them in detail. Secondly, he analyzed the current situation of intellectual property protection in China [14]. From the perspective of social law, Lee proposed that it is a positive step to include scholars in the protection catalogue of the "Convention for the Protection of Intangible Cultural Heritage" and protect them, but it is not a feasible solution to this problem in the end [15]. Grkaynak et al. believed that the technological advancements provided by blockchain are expected to be widely used in various sectors and legal fields, including intellectual property law [16]. Cardoso et al. analyzed the legislative background of the Chinese legal system and the characteristics of intellectual property law courses. He focused on comparing the nature, characteristics and origins of the theoretical analysis teaching method and the case analysis teaching method. The conclusion from this is that the case study approach of the Western legal system, despite its merits, cannot be fully adopted [17]. Chan et al. raised three questions from the user's perspective, raising ethical considerations for large-scale research. Who can see the data? Who can use the data? Who can take the data? These issues involve data privacy and intellectual property issues [18]. The above researches have more specific interpretations of intellectual property legal knowledge, but they are not related to Internet knowledge, nor do they talk about property rights protection research.

In summary, as the reach of the internet continues to expand, the digital realm has become deeply intertwined with our daily work, life, and learning. This study employs the GRU model to calculate the weights of factors influencing intellectual property, leveraging trained model outputs to extract these weights. Utilizing biomechanics theory, the study evaluates the influence of various risk factors from a "stress-strain" analytical perspective, determining their relative significance. Based on these findings, optimization strategies are proposed to foster an environment in China that respects and protects intellectual property comprehensively.

1.1. Characteristics of intellectual property protection in internet field and existing crisis of legal protection of intellectual property rights

(1) Characteristics of intellectual property protection in the Internet field

The main contents of intellectual property protection in the digital and Internet fields include digital copyright, website infringement, Internet copyright infringement, commercial software theft, and email privacy infringement. Infringement of databases and other forms of digital technology is a major intellectual property problem on the Internet [19]. There are different aspects to things that are protected by intellectual property on the Internet, including traditional information, original websites, copyright owners, work organizations, information users, etc. The issue of intellectual property protection on the Internet is clear and complex because it relies on the dissemination of anonymous knowledge on the Internet. The subjects of Internet intellectual property protection are software, databases and networks. Protecting intellectual property on the Internet has become more complex, including protecting debtors from infringing personal and property rights, or passing laws against those in an unlawful position.

Due to the privatization of the Internet industry, internet intellectual property protection is becoming increasingly complex, as shown in **Figure 1**.

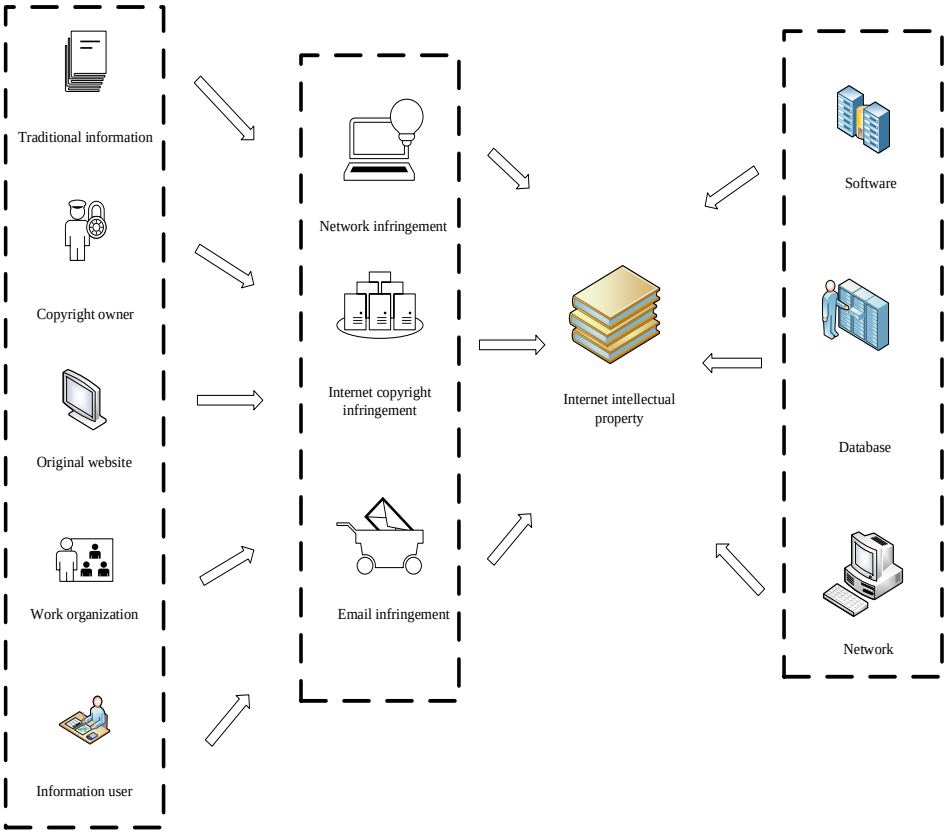

Figure 1. Characteristics of intellectual property rights protection in the internet field.

(2) The existing crisis of legal protection of intellectual property rights in the Internet field

Inadequate mechanisms for monitoring Internet intellectual property. Given the rapid dissemination of the latest information on intellectual property rights on the Internet, serious problems may arise if the information is not generated in a timely manner [20]. However, the current enforcement and supervision mechanism of China's intellectual property law cannot be as effective as any infringement of intellectual property rights, nor can it effectively combat activities that infringe on intellectual property rights on the Internet.

As the three basic rights in the intellectual property system in the Internet field, Internet intellectual property rights, together with copyright, patent rights and brand rights, have carried out an uncontrolled extension of various rights. In the process of developing Internet technology, it has seriously affected the balance of intellectual property rights in cyberspace. For example, in the virtual world of the Internet, patent rights are gradually extended, allowing patent owners to access the Internet or connect to the Internet to expand their patent rights. Especially due to the patent barriers in developing countries, the legal protection of Internet intellectual property rights has brought great challenges to developing countries, as shown in **Figure 2**.

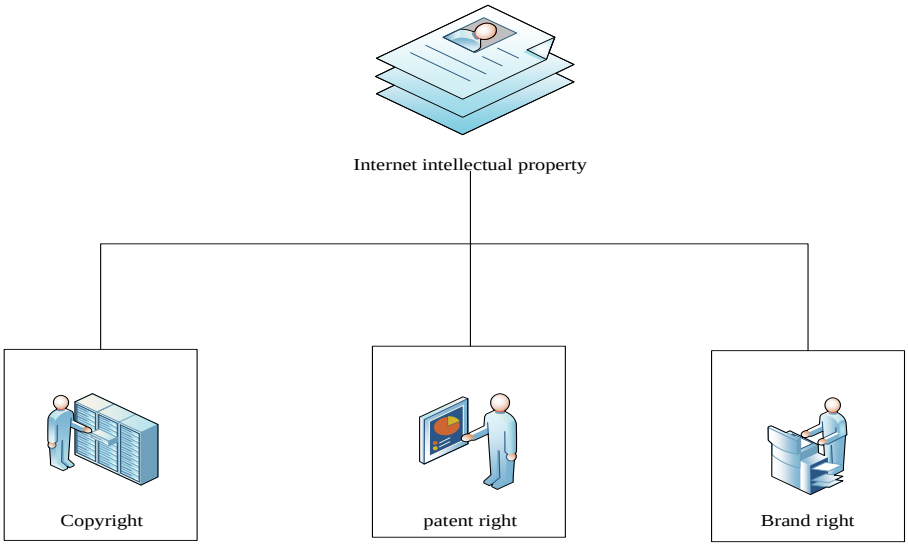

Figure 2. The existing crisis of the legal protection of intellectual property rights in the internet field.

1.2. Characteristics of intellectual property rights and types of infringement in internet environment

(1) Characteristics of intellectual property rights in the Internet environment

In the online environment, intellectual property is now more interconnected than it was in the past [21]. It includes three aspects. In the network environment, intellectual property is virtual. For intellectual property, manufacture and use are virtual, so it is difficult to be protected by law. Second, the intellectual property of the network is different from the traditional intellectual property, which can directly copy and download files and hardware to the network. Simple enforcement and low-cost intellectual property infringement have brought new challenges to intellectual property protection. Third, the intellectual property rights related to the Internet lack obvious geographical characteristics. The vast network and regional nature of human rights violations facilitates respect for human rights. When it comes to intellectual property, it is difficult to determine which government should receive intellectual property protection, as shown in **Figure 3**.

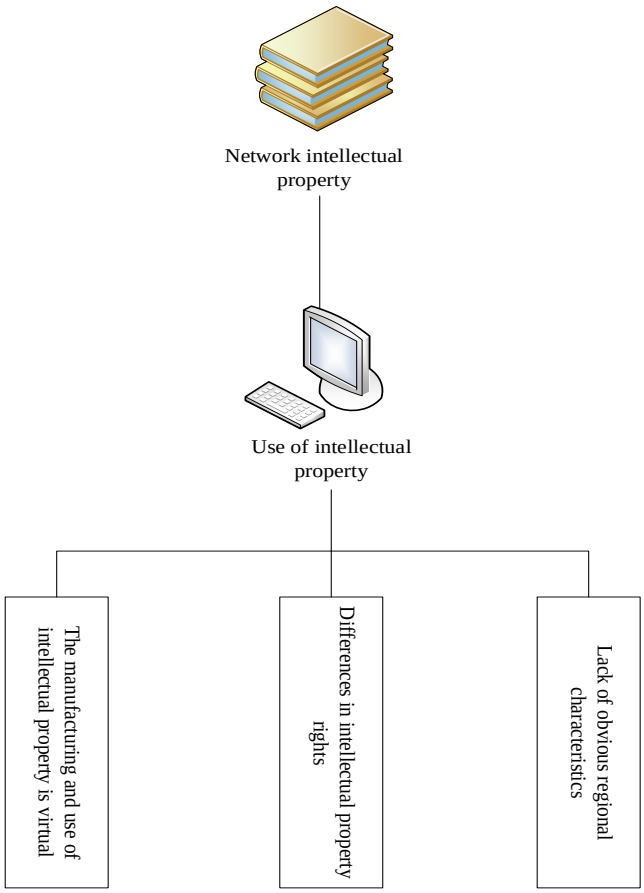

Figure 3. Characteristics of intellectual property rights in the internet environment.

(2) Current Situation of Intellectual Property Protection in the Internet Environment

As we all know, the current Internet has become a "hotbed" for intellectual property infringement and counterfeiting. Government supervision and law enforcement are difficult, and online identification of network users is difficult. A series of problems, such as the difficulty of landing rights from online to offline, etc., have severely restricted rights protection in the network environment. In response to the above situation, courts across China are committed to the construction of intellectual property courts, and provinces and cities would also set up specialized intellectual property adjudication institutions with cross-regional jurisdiction. To a large extent, it has promoted the legal protection of intellectual property rights in the Internet environment [22].

To speed up the promotion of Internet intellectual property legislation, it is first necessary to clarify the responsibilities of Internet platforms, stipulate the platform's supervision and handling obligations for intellectual property infringement, establish a "notice-removal" mechanism, and ensure that the platform takes timely measures to prevent infringement. In addition, legislation should consider solving cross-border infringement issues, coordinating international legal norms, promoting judicial cooperation, and ensuring that intellectual property is effectively protected worldwide. It is also necessary to establish more efficient channels for intellectual property rights

protection, such as special online courts and fast-track trial mechanisms, to protect the legitimate rights and interests of right holders.

Secondly, legislation needs to balance copyright protection and public interests, define the principle of fair use, and avoid excessive protection that affects innovation. For brands and patents on the Internet, the law should refine the standards for identifying infringements to ensure that intellectual property is reasonably protected in the Internet environment. Finally, by revising and improving existing laws and regulations, a systematic and comprehensive Internet intellectual property protection system can be established to better adapt to the needs of the digital and networked era.

1.3. Legal measures for intellectual property protection in network environment

(1) Accelerate the legislation of Internet intellectual property rights

In recent years, China has made detailed revisions to intellectual property laws and regulations, and has achieved a series of creative and scientific achievements in terms of rights content, common strategy, and legal spirit [23]. The current Chinese Internet Intellectual Property Law is imperfect. In most cases, they are described by judicial or administrative agencies, while some are described by the Standing Committee of the National People's Congress on legal grounds. This shows that intellectual property law is not perfect in Chinese law. In general, intellectual property on the web is bad for brands, patents, copyrights, etc. The concept of intellectual property on the web is not part of current law. Therefore, intellectual property protection can only be done in different legal ways and cannot be considered as a systematic approach. Therefore, it is imperative to accelerate the development of laws that clearly describe intellectual property law (including brands and patents on the Internet) and intellectual property issues on the Internet, and gather evidence from the legal system, as shown in **Figure 4**.

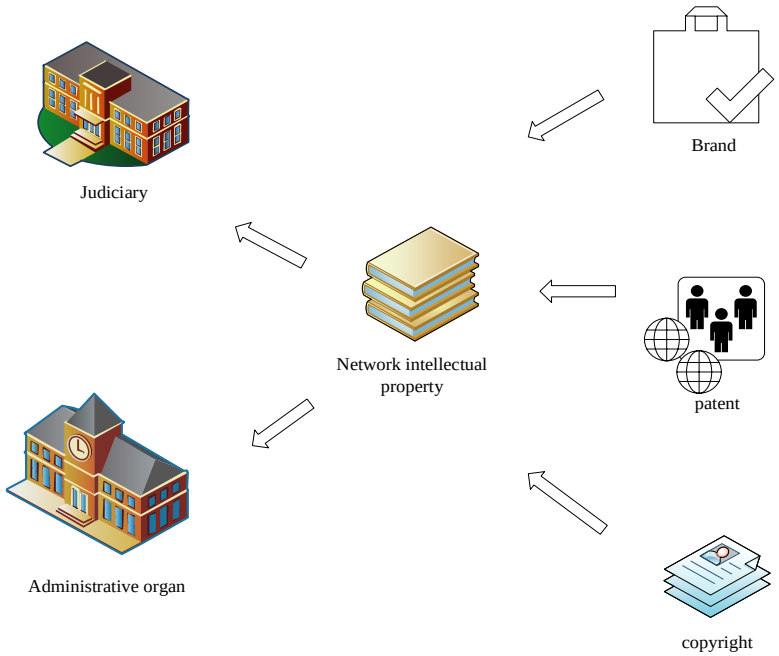

Figure 4. Accelerating the legislation on online intellectual property rights.

(2) Implement innovation and upgrade in information technology

To ensure legal protection of intellectual property rights in cyberspace, we also need to introduce and improve information technology. One is to optimize firewall technology. A firewall is an application software between a computer and a communication network. It is also the only channel of information that blocks attacks between different cybersecurity sites. The firewall can filter the information and data sent by the network and provide necessary security protection for the network information. Therefore, the upgrade of firewall technology is a necessary condition to realize the modernization of information technology [24,25]. Second, network encryption technology needs to improve. This technology is designed to protect the transmission and access of network information from degradation, as shown in **Figure 5**.

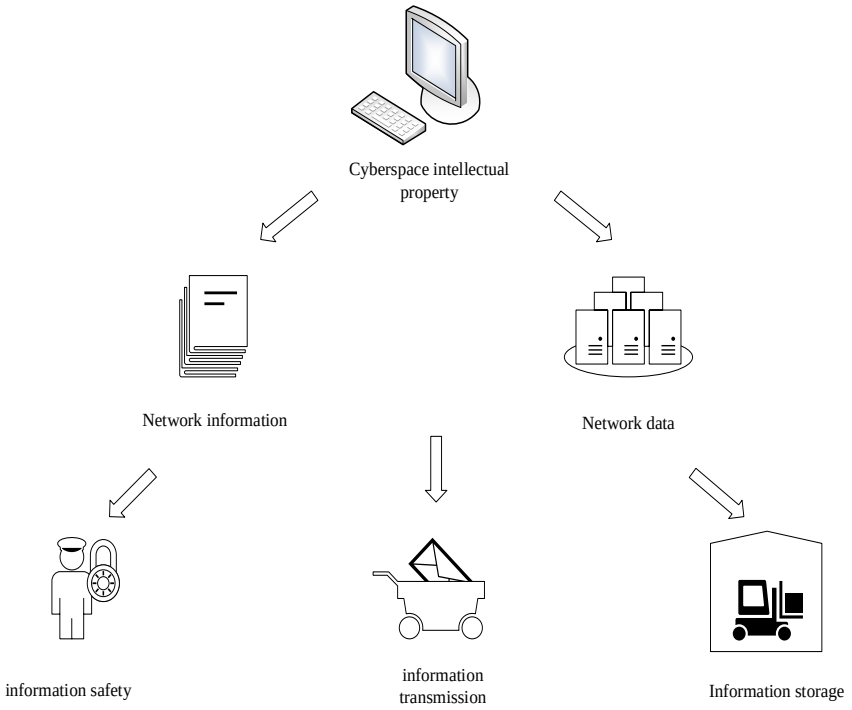

Figure 5. Implementing innovation and upgrading in information technology.

In the network environment, GRU model assists in the formulation and implementation of legal measures by analyzing a large amount of intellectual property-related data. By modeling the time series data of network platforms, user behaviors, and infringement cases, GRU can discover potential infringement trends and patterns and predict potential risk areas, thereby providing a scientific basis for legislatures to optimize legal provisions for Internet intellectual property protection. For example, GRU can identify the high-incidence periods of online infringement or the infringement risks of specific platforms, helping regulatory authorities to accurately formulate policies and strengthen targeted legal supervision.

In addition, GRU can also evaluate the effectiveness and loopholes of current intellectual property protection laws through historical data analysis of judicial decisions and administrative measures. In the network environment, the rapid changes in infringement cases require continuous adaptation of the law. GRU can track

infringement trends in real time and help lawmakers continuously adjust policies. For example, GRU can predict new forms of infringement or platform characteristics, and provide dynamic feedback for the revision of legal measures in a timely manner, thereby improving the flexibility and accuracy of the law in responding to Internet intellectual property protection.

(3) Biomechanics and new perspectives on intellectual property risk analysis

The intellectual property management system can be analogized to a complex biological system comprising multiple interacting entities, such as patents, trademarks, enterprises, and innovators. Biomechanics, which studies the behavior of objects under applied forces, offers theoretical insights that can be applied to analyze the interactions among various factors within the intellectual property ecosystem. In this analogy, risk pressures correspond to mechanical stress, while the accumulation of risks parallels material fatigue.

Intellectual property risk assessment similarly requires consideration of the interactions among multiple factors. For example, complex interrelationships exist between technological innovation and market demand, legal protection and business operations, as well as competitors' strategies and an organization's own development strategy. Drawing upon the multifactor analysis methods employed in biomechanics, a more comprehensive and precise evaluation of intellectual property risks can be achieved. By establishing a multifactor analytical framework to examine causal relationships and synergistic effects among these factors, this approach provides a more scientific basis for intellectual property risk assessment.

In the assessment of intellectual property risks, the modeling approaches employed in biomechanics can serve as valuable references. The dynamic equations used in biomechanics can be adapted to study the propagation of intellectual property risks. For instance, when constructing an intellectual property valuation model, one can draw on the biomechanical methods for modeling complex systems. Key factors influencing IP, such as technological innovativeness, market competitiveness, and legal stability, can be treated as variables within the model. By establishing mathematical relationships among these variables, the model can evaluate the value and risks associated with IP. Furthermore, numerical analysis techniques commonly used in biomechanics, such as finite element analysis and numerical simulation, can be applied to quantitatively analyze and predict intellectual property risks.

2. Methods

The basic idea of using GRU to calculate risk factor weights is to train historical data through the GRU model, learn the relationship between different risk factors, and determine the weight of each risk factor based on the output of the model. Due to the differences in knowledge, professional judgment and risk awareness, and the complexity and uncertainty of risks are difficult to obtain. In risk analysis, subjective weighting of risk factors, objective significance of risk factors, so-called language and standardized calculation methods are considered. This paper uses the direct ambiguity $sim(x)$ to represent the risk ambiguity. For the P and risk factor F of intellectual property, set two ambiguities as α, β, and use the operational relationship:

$$sim(x) = \sum_{n=1}^{m} p\ {}_nT\ (\alpha_1^2 \alpha_2^3 \alpha_3^4) \tag{1}$$

$$sim(x) = p_i T(\alpha, \beta) + p_n T\left(\alpha, \beta o \frac{1}{2}\right) \tag{2}$$

$$sim(x) = \sum_{n=2}^{m} p(\alpha_i) \tag{3}$$

In the method of determining the risk factor weight, the risk factors mainly include occurrence, severity and detection, an intuitive fuzzy evaluation matrix is established according to the given risk factor weight, and the subjective weight of the risk factor is calculated by a standardized method:

$$P(\partial, \beta^2) = (3\alpha)^{-n} Tx \sum_{n=1}^{m} \frac{(\alpha - \beta)(\partial - \beta)^2}{2} = P(\partial, \beta, \alpha^2)\left(\frac{\partial - \beta}{2}\right) \tag{4}$$

In the intuitionistic fuzzy environment, risk thinking can solve the multi-criteria fuzzy decision-making problem, and is widely used to solve the objective weight of attributes. Test degree describes the degree of ambiguity and intuition, the higher the value, the more hesitant the decision is. According to the proposed method, the intuitionistic fuzzy value C_i of each evaluation information is defined, and the objective weight P_i of the risk factor is calculated:

$$C_i = \frac{1 - |\alpha_i - \beta_j| + (1 - \alpha_i^n - \beta_j^n)}{1 + |\alpha_i - \beta_j| + (1 - \alpha_i^n - \beta_j^n)} \tag{5}$$

$$P_i = \frac{\sum_{i=1}^{n}(1 - c_{ij})}{\sum_{i=1}^{n}\sum_{j=1}^{n}(1 - c_i)} \tag{6}$$

According to the objective weight vector α_i, combined with the objective weight of the risk factor P_i, the objective weight of the risk factor can be calculated:

$$P_i = \sum_{i=1}^{n} p_i^2 \alpha_i \tag{7}$$

$$\alpha_i = \partial \beta_i + (1 - \partial) p_i \tag{8}$$

Determining the weight information evaluation is essentially a process of group decision-making, it effectively extracts and aggregates the information of intellectual property risk evaluation, takes the comprehensive evaluation mean value as the reference sequence, and calculates the correlation degree of each evaluation value, and the evaluation value under different intellectual property risks:

$$P_i = \sum_{i=1}^{n} (p_i^2 \bullet \alpha_{ij}) \tag{9}$$

$$P\partial_i = \frac{1}{\beta}\sum_{i=1}^{n}\alpha_j^2 \tag{10}$$

$$P\partial_i = \frac{\beta \max + \max \beta\,(P\partial, \alpha_i)}{T(P\partial, \beta_i) + \alpha \max, \max \alpha\,(P\partial, \beta_i)} \tag{11}$$

Among them, $P\partial$ is the resolution coefficient. The smaller the $P\partial$, the greater the difference between the correlation coefficients and the stronger the discrimination ability. Usually, the value of β is 0.5–1. The correlation degree of the comprehensive evaluation value is:

$$P_i = \frac{1}{\alpha}\sum_{i=1}^{n}\left(\beta_i^2 \bullet T_j^n\right) \tag{12}$$

$$\alpha_2 \max \sum_{i=1}^{n}\left(P^i, \beta^j\right)^2 \tag{13}$$

In the evaluation stage, the information is judged by relying on the weight function of the value function and probability. When evaluating IP risks, there is a tendency to point to greater risks, the larger the prospect value, the greater the risk. Therefore, the idea of prospect theory ranks intellectual property risk, and the steps are as follows: Determine the mean value of the evaluation of intellectual property risk under different risk factors:

$$\alpha_i^j = \sum_{i=1}^{n}\left(P_i^j, \beta_{ij}^2\right) \tag{14}$$

$$\partial_i = \frac{\min, \min(P\partial, \beta_i) + \min \beta\,(P\partial, \alpha_i)}{T(P\partial, \beta_i) + \alpha \max, \max \alpha\,(P\partial, \beta_i)} \tag{15}$$

According to the intuitionistic fuzzy number partial order definition of the value function obtained from the above formulas, the value functions of intellectual property risk $\delta(\chi_i)$ and risk factor μ_i^j are obtained as:

$$\delta(\chi_i) = \frac{\mu_i^j}{\mu_i^j + (1-\mu_i)^n} \tag{16}$$

$$\delta(\chi_i) = \frac{\mu_i^j}{\mu_i^n + (1+\mu_i)^n} \tag{17}$$

$$\delta(\chi_i) = \sum_{i=1}^{n}\mu\left(\alpha_{ij}^n\right) \bullet \partial\left(\mu_j\right) \tag{18}$$

$$\delta(\chi_i) = \sum_{i=1}^{n}\mu\left(\alpha_2 \bullet \beta_i^j\right) \tag{19}$$

Once the objective weights and values of risk factors are determined, biomechanics-based force analysis can be applied to evaluate and assess IP risks. By modeling IP risk as a dynamic system and drawing analogies to mechanical theory, this approach reveals the patterns of risk variation and provides a scientific basis for optimizing legal protection strategies for IP. In this framework, IP risk can be conceptualized as a "state variable," risk factors as "forces," and the weights of these factors as the "magnitude of the forces." Through "stress-strain" analysis of the state variable, the dynamics of risk variation can be uncovered and quantified.

To enhance the scientific rigor and adaptive capacity of strategies for optimizing IP legal protection, a feedback control model from biomechanics is introduced. This model establishes a "intervention-response-adjustment" strategy, where changes in the presence or magnitude of forces result in varying levels of risk for IP. This approach provides a novel analytical perspective for developing responsive and effective IP legal protection strategies

3. Results and discussion

To further understand the property rights protection issues, a questionnaire was used to investigate the infringement issues suffered by the creator of a website within one year. This article investigates the patent infringement, invention infringement, utility infringement and reprint infringement that the creator of this website has been infringed on. The number of people surveyed is 100, and the basic information is shown in **Table 1**.

Table 1. The infringement within a year.

	Patent infringement	**Invention infringement**	**Practical infringement**	**Reprint infringement**
First quarter	52	42	43	78
Second quarter	42	65	41	81
Third quarter	61	82	42	91
Fourth quarter	54	24	32	62

Among them, the specific statistics of patent infringement, invention infringement, utility infringement and reprint infringement that have been infringed by website creators are shown in **Figure 6**.

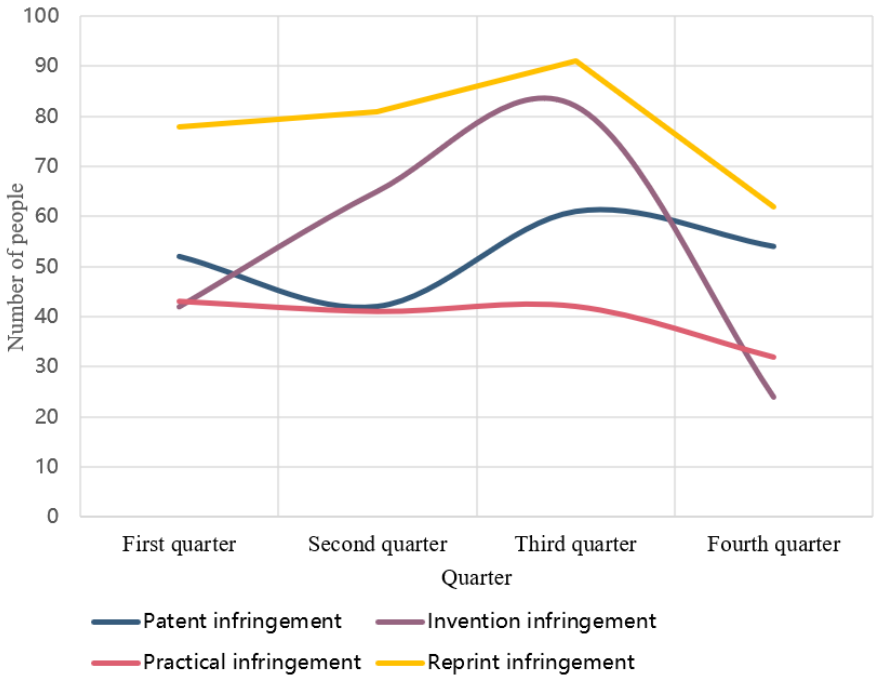

Figure 6. The infringement by the creators within one year.

As can be seen from **Figure 6**, the current intellectual property problems of Chinese creators continue to occur. This shows that the issue of property rights has not been fully protected by law, the implementation of information technology upgrades. To strengthen the construction of intellectual property law, the most important thing is to establish a sound intellectual property protection institution, speed up the progress of Internet intellectual property legislation, and implement the upgrading of information technology, and the most important thing is to strengthen the construction of citizens' moral awareness. Only in this way can the creator's intellectual property rights be guaranteed not to be infringed, and the security of China's intellectual property rights can be protected.

This paper investigates the investigation and inquiry of different creators. This paper examines the results of creators' efforts to strengthen the protection of intellectual property rights after supervision to their own intellectual property rights. The occupations of creators are more diverse. In this paper, they are A, B, C, D, E, F, respectively, and the evaluation results are embodied in the intellectual property rights after inspection, supervision and protection. The sample size is 600 people. The evaluation results are divided into four levels: satisfied, good, average, and not interested. The specific effects are shown in **Figure 7**.

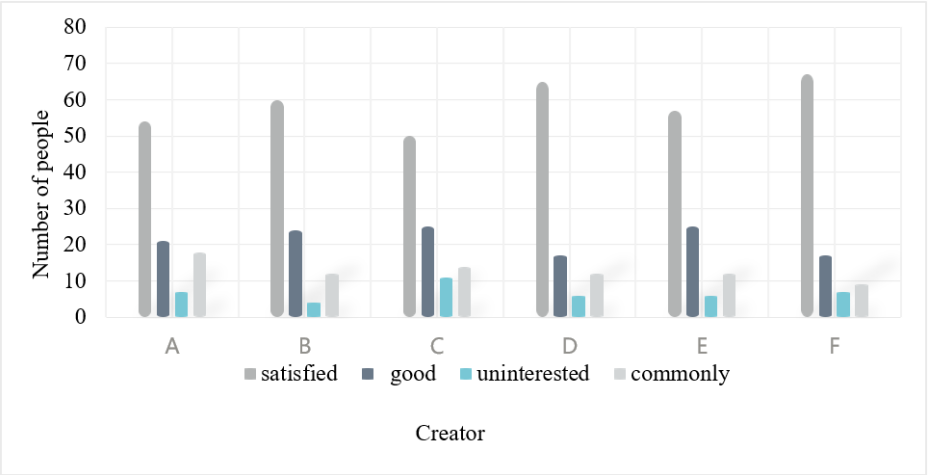

Figure 7. To strengthen the understanding and supervision of intellectual property rights.

As shown in **Figure 7**, creators of six different occupations have a relatively high degree of recognition of the enhanced intellectual property protection after supervision, and the majority are satisfied. Among them, creators in the two occupations D and F are the most satisfied with the protection of intellectual property rights after strengthening supervision, while there are fewer creators with low recognition and disapproval. The protection of intellectual property rights after strengthening supervision is still very recognized and loved by creators. Moreover, it has played a great role in improving the protection of intellectual property rights and strengthening the level of legal construction. With the development of the Internet, the strategy for intellectual property protection has changed, and the intellectual property protection of creators has been gradually strengthened. The concept of intellectual property has undergone a great change, and it has begun to effectively protect and enhance the creator's personal intellectual property. After strengthening the protection of intellectual property rights after supervision, the intellectual property protection of creators increased by 18%.

In order to detect the traditional property rights protection and the existing property rights protection mode, we investigated the property rights security of 100 creators under the two intellectual property protection models, and the changes are shown in **Figure 8**.

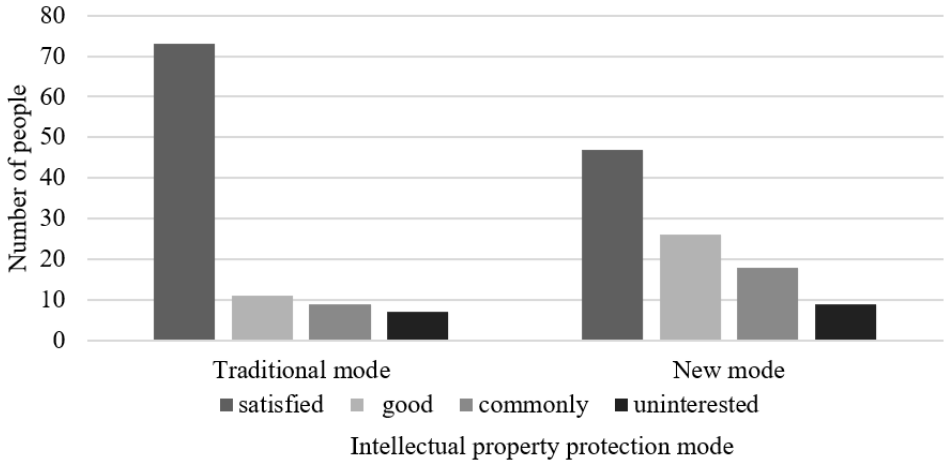

Figure 8. Comparison between traditional intellectual property protection mode and new intellectual property protection mode.

It can be seen from the bar chart in **Figure 8** that the two intellectual property protection modes are in different states. Because the protection aspects and publicity methods of the two intellectual property protection models are different, the efficiency of intellectual property protection would not remain unchanged. Compared with the two intellectual property protection modes, the protection efficiency of the traditional intellectual property protection mode is relatively low and fluctuates greatly. The new property protection model has fluctuations, but the fluctuations are not large, and the protection efficiency is higher. Carrying out intellectual property protection publicity through the Internet can increase more exposure and maximize the effect of property protection publicity.

In order to make the public better understand the importance of intellectual property protection, this article carries out publicity activities on intellectual property protection. It aims to increase citizens' understanding of intellectual property. In order to test the impact of intellectual property protection propaganda on the public, the survey was conducted for citizens of different age groups, namely, A, B, C, and D to evaluate. This paper evaluates whether publicity can enhance the importance of protecting the intellectual property rights of creators in the public mind. The evaluation results are embodied in the change and impact of publicity on the importance of protecting the intellectual property rights of creators in the public mind. The number of samples is 400, and the evaluation results are divided into four levels: satisfied, good, average, and not interested. The specific effects are shown in **Figure 9**.

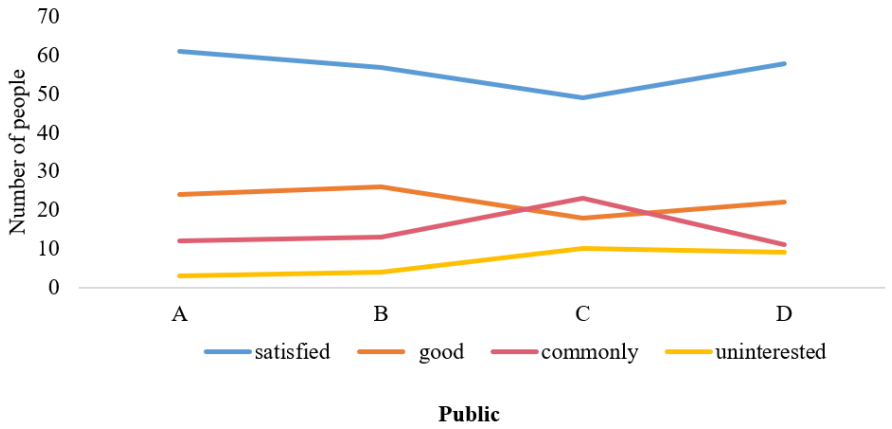

Figure 9. The public's awareness of intellectual property rights has been changed.

According to **Figure 9**, it can be seen that after the publicity of intellectual property protection, the public's understanding of intellectual property protection has improved a lot, and the majority of people with high awareness, while the creators with low awareness and ignorance are very few. Because the current public awareness of the legal protection of intellectual property rights on the Internet is very weak. The protection of intellectual property rights in China started relatively late, and did not pay much attention to the thorough education of intellectual property laws. The general public is still quite unfamiliar with the legal provisions on the protection of intellectual property rights, and generally lack legal awareness of intellectual property protection. We should strengthen the public's awareness of intellectual property rights and enhance the intensity of intellectual property rights protection.

4. Conclusion

This study employs case studies and surveys to gain an in-depth understanding of the current state and challenges of IP protection. Utilizing a gated recurrent unit (GRU) model, it calculates the weights of risk factors, followed by a biomechanics-based analysis to evaluate IP risks. The findings indicate that GRU effectively identifies relevant risk factors and computes their respective weights. Integrating biomechanical concepts into strategies for optimizing IP legal protection in China provides insights into the dynamic relationships between factors and risks, facilitating the evaluation and prediction of future IP risks.

The connection between biomechanics and IP risk assessment lies in their shared focus on pressure distribution, dynamic variations, and risk optimization within complex systems. By adapting modeling approaches and optimization theories from biomechanics, IP risk assessment can achieve more refined analysis and forecasting, offering a novel perspective for enhancing strategies in IP legal protection.

Computer network brings comfort to people's life and work, but often leads to the problem of intellectual property security. This not only causes serious damage to the network environment, but also marks the healthy development of the network society. Under network conditions, intellectual property has its own nature and mode of operation. In this regard, IP owners and investors should clarify the importance of IP protection, speed up the drafting of IP protection laws in cyberspace, better protect the rights and privacy of creators, and prevent cyber involvement through appropriate

means. In order to improve the awareness of legal protection of Internet intellectual property rights, the real-name system can be used to protect Internet intellectual property rights and protect the legitimate rights and interests of rights holders. This prevents cyber infringement.

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