

# Law and Economic Analysis of the Ownership of Artificial Intelligence Creation

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## ABSTRACT

The creation of artificial intelligence has enriched the market of works and has triggered thinking about the copyright protection of artificial intelligence creations. This article clarifies the copyright ownership of artificial intelligence, Combined with the status quo of the attribution of artificial intelligence creations to analysis. Using the analytical methods of law and economics, transaction cost theory concludes that user ownership can reduce transaction costs more. Compared with investors, the positive externality benefits exerted by the ownership of user rights in the externality theory are more obvious. From the perspective of game theory, the rights of artificial intelligence creations belong to the users, which are more conducive to promoting the development of artificial intelligence technology, it is more practical and feasible to attribute the rights of artificial intelligence creations to users.

**KEYWORDS:** *copyright; artificial intelligence creation; law and economics; game theory*

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## I. INTRODUCTION

The application of artificial intelligence technology in various industries has become more and more extensive. The latest "China Artificial Intelligence Software and Application (2nd Half of 2019) Tracking" report released by the International Data Corporation (IDC) shows that China's artificial intelligence software and application market reached US\$2.89 billion in 2019[1]. Including hardware, the overall market size will Reached \$6 billion. Judging from the current market development and the series of strategies formulated by the country, artificial intelligence is profoundly affecting all aspects of society[2].

The rapid development of artificial intelligence has brought a new atmosphere to the work market, and the resulting status of the ownership of artificial intelligence creations has become a practical problem that needs to be solved urgently, in order to solve this problem, we should analyze it from two angles, the first problem that needs to be solved is whether the artificial intelligence creation contains human willful creative labor, whether it has originality, and on the premise that it has the attribute of the work, it is possible to further discuss and analyze the attribution of the works. One solution is to implement the rights allocation rules of the Copyright Law, and assign the rights of artificial intelligence creations to creators or investors, or make a breakthrough in the subject of artificial intelligence, identify artificial intelligence as a new author outside of natural persons, legal persons, and other organizations. With the development of science and technology, the effect of artificial intelligence learning has achieved a qualitative leap, and the error rate in

independent judgment and response has been significantly reduced. What needs more attention is that artificial intelligence has gradually departed from human pre-design in content generation, and can create creations based on data obtained by itself. Artificial intelligence creations have changed the ecology of production and dissemination of works, thereby profoundly affecting the copyright law of production and dissemination of works. This impact is manifested not only in the impact of artificial intelligence creations and natural person authors' competition on the existing operating mechanism of the copyright law, but also in the policy choices for the copyright protection of artificial intelligence creations. Artificial intelligence breaks the restrictions on people, and the content of its creation is more original than humans can reach. Therefore, it is realistic and reasonable to obtain copyright protection for artificial intelligence creations[3].

## II. THE CURRENT STATUS OF THE OWNERSHIP OF ARTIFICIAL INTELLIGENCE CREATIONS

The issue of copyright ownership of artificial intelligence creations involves the formation of artificial intelligence creations. There are three subjects, the subjects may be independent, or there may be crossovers between subjects. Developers are the basic source of artificial intelligence creations, the design of the program and the generation of the final form are related to the development of the original programmer. In the generation of artificial intelligence results, developers only stay in the initial stage, and the required efficiency distribution is achieved in the first

benefit distribution. The relationship formed between the developer and the investor is a principal-agent relationship, the source of the developer's remuneration is mainly the payment of the investor. When the design of the program is completed, the developer's node ends here, and the profitability relationship formed in the future should not be obtained by it. The existence of the main body of investors is the material support, the investment of funds enables the development of the program, and whether investors are eligible for copyright should be discussed accordingly. From the economics of market behavior, the purpose of investors is to increase productivity and realize market transactions to return results, the user is the main body that directly generates the content. Through the use of the user, artificial intelligence produces the corresponding work.

The user's subjective intention to expect the formation of the work plays a direct role in the realization of the results, which is more realistic for commercial development and market transactions. In weighing the distribution of copyright between the two, which one is reasonable, different scholars have put forward different views. Chen Quanzhen believes that the identity of the author and the investor is only a superficial issue, the needs and interests of investors are the driving force for development, and the protection of the interests of investors is the optimal configuration of the cultural industry[5]. Huang Shanshan believes that artificial intelligence is based on the difference between algorithms and learning data, and its creations are original and are works under copyright. The works refer to the "film producer model" and attribute the copyright of artificial intelligence to investors[6]. Huang Yuye explained the artificial intelligence creations from the perspective of the fruit theory, and believed that the artificial intelligence creations belonged to them. Discuss from different theories and research methods, analyze from the angle of law and economics, and put forward corresponding views on the ownership of rights, the theoretical significance of its existence and the views on the ownership of rights consistent with reality[7].

### III. Law and economic analysis of the ownership of artificial intelligence creations

The copyright system is an intellectual property system, and its significant economic value is a scarce resource in society. The use of legal and economic analysis methods to explore the protection of artificial intelligence copyright can stimulate the enthusiasm of creators to innovate and have a practical discussion.

#### A. Cost-effectiveness

Transaction cost is because the product is private in the initial configuration, and the transaction cost due to the existence of transaction cost reduces the efficiency of society. The generation of transaction cost is that the product is private in the initial configuration, and the transaction cost arising from the existence of transaction cost reduces the efficiency of society. Artificial intelligence creations cannot determine the ownership of the copyright, and need to spend corresponding energy to obtain the corresponding benefits. On the other hand, in the dispute of ownership, it takes a lot of time and litigation costs to fight for the benefits of copyright, this increases the corresponding cost of society and reduces the efficiency of the entire society. For works without fixed ownership, in the process of circulation, the

third party needs to negotiate to obtain the ownership, which will produce transaction costs. If the transaction fails, it will lead to waste of transaction costs. Develop a reasonable use system to reduce the damage to the license transaction, reduce transaction costs, and greatly reduce the possibility of failure in the process of market transactions. If institutional arrangements are made for the ownership of rights, and every use of a copyrighted work requires the consent of the copyright owner, the circulation of copyrighted works, the realization of copyright interests by the copyright owner due to the circulation of works, and the realization of the purpose of copyright law will all be seriously affected influences[8].

When the rights of artificial intelligence creations belong to the creator, the formation of artificial intelligence works depends on the storage of a large amount of data, and the final operation of the creator completes the work. Investors get benefits when artificial intelligence is completed, and the formation of subsequent works should not belong to investors. In the formation of artificial intelligence creations, users play a key role in it. From the initial economic investment to obtain ownership, to provide basic information and data for artificial intelligence, and then the logic and expression are modified, finally the value of artificial intelligence creations is formed. The existence of the copyright system clarifies the rights holders and is conducive to improving efficiency. While benefiting individuals, it reduces social costs, improves the efficiency of the entire society, and promotes the development and progress of the entire society. The reasonable ownership of copyright reduces social costs to a certain extent and is conducive to the realization of transactions.

#### B. Externality theory

Copyright protection can effectively integrate social resources, reduce the cost required by society, copyright protection can effectively integrate social resources, reduce the cost required by society, copyright protection can effectively integrate social resources, reduce the cost required by society, realize the free flow of supply and demand information and the optimal integration of social resources. The reasonable setting of the ownership of artificial intelligence creations reflects a positive externality, and its significance is that when the copyright of the work is clear, the benefits obtained on the original basis can reduce the cost. Moreover, when using the works, it can predict the development status of artificial intelligence and the possibility of future development. From the perspective of social and economic development, it will improve the social and cultural level and promote the development and progress of science and technology[9].

Artificial intelligence does not have the ability to create and not have the possibility of stimulating its creation, but it cannot ignore the infinite creative ability of the subject that creates artificial intelligence. If we deny the copyright protection of artificial intelligence creations, the lack of copyright will affect the enthusiasm of artificial intelligence designers, leading to a sharp decline in the number of artificial intelligence within the public domain, which has a negative impact on the level of production technology. Unprotected works entering the social realm will seize the creator's market, greatly compressing the space for creation, making the value creation of the work infinitely zero, so

creators lose the enthusiasm and motivation to create. How to fully release the benefits of artificial intelligence works, internalize external benefits as an incentive mechanism, weigh the benefits of copyright and the benefits of users of the work, and clarify the ownership of rights, so as to promote the flow of knowledge throughout the society, give full play to the positive effects of the copyright ownership of artificial intelligence creations to the entire society[10].

The rights of artificial intelligence creations belong to the users, and the social benefits it brings are the most stimulating the vitality of the market. Users play a decisive role in the creation of works and bring more direct impacts on investment. In terms of its interests, the point of its interest lies in the development of artificial intelligence, and the ownership of the right to use after the user purchases it. The behavior of controlling artificial intelligence makes the formation of the work and the positive effect of the right attributable to the user more obvious. In the case of assigning rights to investors, the result is that users are slack in using artificial intelligence to produce works, and are sluggish in the input, sorting, mining and output of data. It is lax in the formation of artificial intelligence creations and is not conducive to the development of the entire society as a whole.

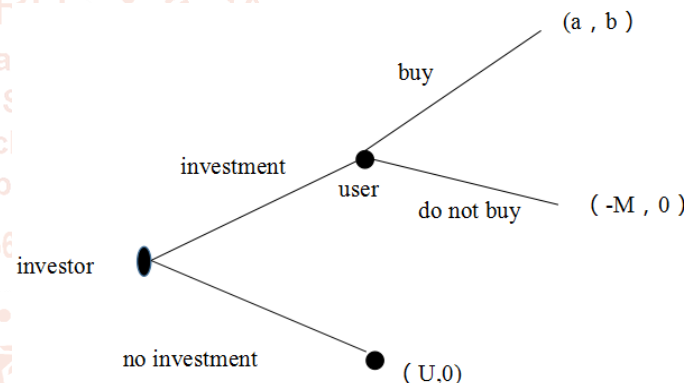
**C. Game theory**

**1. Copyright allows both parties to the game to communicate, both achieve the maximization of overall benefits with minimal cost**

The current situation of information asymmetry and economic power gap has brought preferential protection to decision-making counterparts. The game between the two makes the effective use of the overall resources of the copyright society and the free flow of supply and demand information in order to achieve Pareto optimality. The realization of it provides an effective theoretical approach to avoid resource waste and cost sunk caused by zero-sum games. In the knowledge market, if we simply pursue the fairness and justice of the society as a whole, it will definitely be detrimental to the high-speed circulation of information and the continuous progress of knowledge. If copyrights are not granted to artificial intelligence creations, a large number of "works" that are not substantially different from ordinary works created by humans but are not protected by copyright will flood the market. For users of works, there will be more and more works to choose from without paying copyright fees. In the long run, works that maintain copyright value can be realized because they are highly creative or rely on the author's good reputation. The economic value of other human works that originally occupied most of the market will be infinitely close to zero. There is a phenomenon of copyright licensing and assignment[11]. According to Posner's theorem, if market transaction costs are too high to inhibit transactions, rights should be given to those who value them most. Undoubtedly, the law not only needs to consider the extent to which the two parties in the game of interests need this right, but also the objective status gap between the parties. The right ownership of artificial intelligence creations is judged by investors and users. The game of rights between the two will increase its social regulation when it belongs to which can promote the prosperity and development of the cultural market and strengthen copyright Attribution of rights.

**2. The initial stage of the formation of artificial intelligence creations is the capital investment of investors, then to the development of software by developers, and finally the use of software by users**

The relationship between investors and developers is a principal-agent relationship. Developers' interests are obtained from the remuneration income that investors give them. From the ownership of artificial intelligence creations, the game is used to determine which one has more market value. The game structure of investors and users is depicted by graphics. The initial consideration is that investors invest funds in R&D activities, and the motivation to stimulate investors is the return on profits. The cost of investors lies in the remuneration paid to the developers, the cost of the previous project, and after the artificial intelligence is put on the market, there are two options, namely, free entry into the market and relying on traffic to earn income. There is no doubt that this model The users of the product have corresponding ownership rights to the works formed by using the product. Another way is to make it the only user through paid sale to the corresponding purchaser. The user has the corresponding ownership. Another way is to make it the only user through paid sale to the corresponding purchaser. The user has the corresponding ownership. The owner uses the artificial intelligence to make the corresponding creation and obtain the work, and then conduct judgment and analysis. From the perspective of market excitation, consider choosing investors or users.



**Figure 1 game model**

In this game, investors first choose to act. If investors choose not to invest, the game ends. Investors can transfer their investments to other places for corresponding investments and obtain corresponding benefits U. At this time, since the user will not obtain the artificial intelligence for creation, the income obtained is 0. If the investor chooses to invest, then Users can choose to buy, or choose not to buy. The motivation to motivate users to purchase is to be able to bring corresponding benefits, to obtain ownership after paying the corresponding consideration costs, and to weigh the benefits that can be brought in the subsequent use process. In the developed artificial intelligence, when there is no corresponding buyer in the market, the investor has no benefit due to the corresponding cost. The benefit obtained is -M, and the benefit of the corresponding user is zero. After the user purchases, the investor's investment income is a, and the user's income is b. When the user's gain b is greater, there will be more buyers in the entire market, and people will have the motivation to make corresponding investments. When the user has the right to use the artificial intelligence, the subsequent works using artificial intelligence creations are attributed to the user, which has a



clear positive effect on the increase of the user's income. The initial cost of investment in artificial intelligence purchases will become more obvious in the future earnings days. From the cost-benefit approach, the user's purchase behavior is weighed by a comparative analysis of its benefits and costs. When the cost is fixed and the market's legal policies are more biased towards the benefits of the user, the user will adopt purchase strategy. In the entire market, the development of artificial intelligence has brought new development trends to the works, which is more in line with the development of the existing market economy. On the other hand, users' purchases increase. Investors will also make corresponding investments when they find that there are more potential markets in the market. The entire market forms investors' "investment" strategies and users' "purchase" strategies. In such a dynamic game, the development of artificial intelligence in the entire market and the development of artificial intelligence creations will be more dynamic, which is conducive to the prosperity and development of the entire cultural market, it is better to design the system when the rights are assigned to users before the system is agreed.

#### IV. THE DESIGN OF THE COPYRIGHT OWNERSHIP SYSTEM OF ARTIFICIAL INTELLIGENCE CREATIONS

Combining the existing theory of copyright, according to the actual development needs, using the analysis method of law and economics, the attribution of the copyright of artificial intelligence creations, and adopting artificial intelligence users as the first right holder is more in line with current economic development and is more appropriate. The prosperity of the cultural market can also be combined with other supporting systems to realize the completeness and scientificity of artificial intelligence creations.

##### A. Differential treatment of artificial intelligence and human works

Compared with traditional works of artificial intelligence creations, traditional copyright law emphasizes the attributes of natural persons. On the one hand, it encourages the author's creative enthusiasm. On the other hand, the thoughts expressed by the author's true feelings can resonate with readers. As an emerging field, artificial intelligence is still very unknown, and it penetrates into all aspects of life, and corresponding systems should be formulated according to its particularity. Artificial intelligence is a human creation, and its original status is a thing. Granting artificial intelligence the legal subject status is an innovative path that breaks the convention, but this innovation will cause the artificial intelligence itself as an industry or product and the existing legal system. In practice, we distinguish between artificial intelligence works and human works, and make detailed classifications of works created and designed by robots. There are related laws and regulations, even if a large number of works created by artificial intelligence flock to the market, the monitoring of artificial intelligence. Within the scope, it will not have a greater impact on the enthusiasm of human creation, and will not play a negative role in innovation.

##### B. Artificial intelligence creations suitable for employment works

The analogy of artificial intelligence creations is applied to protect artificial intelligence creations, which can not only

realize the incentive effect of intellectual property rights, but also indicate the value that appears in the creation process; realize the protection of artificial intelligence creations at a lower cost. Protection, while improving the efficiency of protection. The right to create artificial intelligence works belongs to the user. The creation of artificial intelligence works is based on a large amount of data. The works of artificial intelligence can be defined as professional works, the artificial intelligence creation is to realize the artificial intelligence task. Artificial intelligence users are the economic benefits brought by artificial intelligence [12]. Get rid of the traditional thinking of artificial intelligence copyright, give the status of artificial intelligence users and employee status, through the employment of the work model to reasonably solve the problem of the copyright ability of artificial intelligence and the distribution of benefits, to promote the continuous development of artificial intelligence technology and the realization of innovation power.

##### C. Construct a liability mechanism for tort of artificial intelligence creations

When the infringement of artificial intelligence creations occurs, there is no corresponding conclusion for the time being how to bear the infringement liability. Artificial intelligence is a combination of big data and resource integration to produce new works. The output of massive works is the performance of artificial intelligence's high efficiency and high output. Once infringement occurs, the consequences of its damage are immeasurable. Setting artificial intelligence compulsory insurance is an effective way to share infringement liability. The establishment of a special artificial intelligence creation infringement damage compensation fund, in view of the huge economic value and social impact of artificial intelligence, when the creation of artificial intelligence causes infringement, the fund can reduce the burden of a single responsible subject. Finally, a good retrospective mechanism for assuming responsibility for infringement is constructed so that there can be traces to follow when assuming responsibility. When users of artificial intelligence cannot prove that they have fulfilled their prudential obligations, the users themselves shall bear the corresponding tort liability. When the infringement of the artificial intelligence creation is related to the developer, the infringement liability shall be assumed for the compensation of the infringement [13]. The improvement of the tort liability system for artificial intelligence creations is more conducive to the protection of artificial intelligence copyrights.

#### V. CONCLUSION

The copyright protection of artificial intelligence creations. The existing copyright protection poses new challenges. How to rationally arrange the design of the system, and which party the rights belong to is more conducive to the development and construction of social order and culture, using legal and economic analysis methods. Discuss the rationality from the aspect that rights belong to users. Analyzing the influence of the behavioral incentives of the ownership of rights, stimulating the creative vitality of the market, and further extending the creation protection of the copyright law are issues worthy of in-depth study and continuous exploration. To further promote the advancement of artificial intelligence technology, to better build an era that is more compatible with the actual

development of reality, to further regulate and develop artificial intelligence products, artificial intelligence creations should be protected, and the ownership of rights should be more clearly defined. It is helpful to stimulate the vitality of the market and create a more prosperous cultural scene.

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