

# The Criminal Charge of Cracking Captcha Integrated Solution of Breaking Cyber Verification System

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**ABSTRACT:** CAPTCHA is the abbreviation of Completely Automated Public Turing Test to Tell Computers and Humans Apart, which is used to guarantee the cyber security. Cracking captcha means imputing a large amount of captcha once a time illegally. Although it cannot be affirmed as accomplice generally, cracking captcha still should be given criminal sanctions since it provides plenty of assistance for other crimes essentially. If the culprits do not have collusion with others, helping criminal activities of information and network should be the most suitable charge. On the contrary, if there exists evidence proves the culprits have collusion with others, then he or she is supposed to be convicted the same charge as the person who is helped. What's more, other behaviors of destroying cyber safety verification system, like fake face recognition and Using AI technology to crack captcha, are similar to cracking captcha, so that we can try an integrative solution to regulate referring to this.

**KEY WORDS:** cracking captcha; charge of helping criminal activities of information and network; Expanding interpretation; cyber safety verification system; integrative solution

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The development of the information age has continuously improved the requirements for the security of the network environment. The security verification system when logging in various software and platforms has become an indispensable guarantee, and the captcha is the most typical one at present. However, the development of technology tends to breed new types of crime. Recently, the black industry chain of ' database collision ', including cracking captcha, has become increasingly rampant. The technical assistance provided by it has become a key factor in the implementation and completion of other information network crimes, and has extremely serious social harm. As a help behavior of alienation in the network environment, cracking captcha is difficult to apply the traditional accomplice theory alone. Although the first case of "cracking captcha" and the case of " Kuai-ah" platform in China have separately investigated the criminal responsibility of cracking captcha for the crime of providing intrusion into computer information system procedures, due to the lack of independent evaluation and analysis of this behavior in the judgment logic, there is no suitable and complete qualitative thinking for cracking captcha.

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## 1. Analysis of cracking captcha -- taking the first ' cracking captcha ' case in China as an example

As a key part of the black industrial chain, cracking captcha provides illegal technical services and help for information network crime, and its harm cannot be underestimated. It is necessary to study the qualitative nature of cracking captcha, and the first case in China has a typical reference value.

### 1.1 The current situation of cracking captcha

CAPTCHA ( Completely Automated Public Turing Test to Tell Computers and Humans Apart), a simple explanation is an answer-based verification program to distinguish computers from humans. As a security defense measure, it has played an extremely important role in resisting illegal login of network black industry. In the database collision and other black industries, the number of accounts screened is huge, and tens of thousands of captchas need to be cracked. It is impossible for practitioners to manually identify them one by one. Therefore, it is necessary to improve the efficiency of database collision and cracking captcha by batch operation, a special technical service called ' cracking captcha ' was born as a result.

#### 1.1.1 Black Chain Structure and Operation Process of cracking captcha

Cracking captcha means identifying and breaking the captcha. At present, the most common form of cracking captcha is still organizing a large number of people to manually operate. The operator of cracking captcha mainly consists of three parts : the first is the production and provider of batch login account password software ; the second is the organizer of the cracking captcha industry, namely the agent ; the third is the people at the bottom. In the first case of "cracking captcha" in China, Ye is the provider of batch login account code software. The " small yellow umbrella " software developed by Ye can not only log in the account code of Taobao website in batches through technical means, illegally obtain user's data, steal ID information such as account level and registration time, but also transmit the captcha required for batch login to the access cracking platform. The people on the platform fed back to the " small yellow umbrella " software after completing manual identification, so as to achieve data screening and break through the security technology of the website. <sup>[1]</sup>Zhang belongs to the agent, who accepts Ye 's commission to put the coding software " Small yellow umbrella " on the AB website<sup>1</sup> platform for distribution tasks and statistical data and publish links and tasks to websites or agent groups to organize a large number of paid labour . The people only need to click on the link to access, download the corresponding software and apply for its own number, and then run the software to enter the required captcha one by one. <sup>[2]</sup>What needs to be distinguished and explained is that the term ' code collision library ' commonly seen actually contains two different concepts - ' cracking captcha' and ' database collision'. cracking captcha itself only has the function of batch captcha, and database collision refers to the behavior that hackers obtain a large number of Internet accounts and password information through illegal means, generate the corresponding dictionary table, and use technical means to try to log on to other websites in batches, and screen out a series of accounts passwords that can effectively login to other websites. It can be said that 'cracking captcha' is necessary to complete the ' database collision ' process.

#### 1.1.2 The serious social harmfulness of ' cracking captcha '

Identity authentication is one of the basic technical elements of information security and the first threshold for information system security. Compared with user-known ( such as password ), user-owned ( such as USB key ) and user-specific ( such as fingerprint ) these three traditional ways to identify user

<sup>1</sup> Many users use the same account password in different websites. Hackers can try to log on to website B by obtaining users ' accounts on website A , so as to realize the library collision attack. Here, these two different websites are represented by letter AB.

identity, captcha due to its random generation characteristics, can more effectively prevent computer programs against password violence attacks. <sup>[3]</sup> Although cracking captcha does not directly enter the users' system and account, and it does not directly produce harmful results, it illegally batch cracking login security verification system and provides technical support and services for network blackmail, which is huge in number and has a wide range of influence, and seriously threatens the security of the information network environment. <sup>[4]</sup> It violates Article 27 of the Cyber security Law and Article 1034, paragraph 1, of the Civil Code. In the whole network environment, it will also lead to the psychological panic of Internet users, lack of trust in the network industry and even the government, and undermine the security guarantee mechanism of the network environment and the normal order of the network society. In addition, illegally batch cracking captcha also provides convenience for a series of theft, fraud, concealment of proceeds of crime, and becomes a hotbed for breeding other cyber crimes.

### 1.1.3 Judicial accountability for cracking captcha is scarce

On May 18, 2018, the Hangzhou Yuhang District People ' s Court of Zhejiang Province ruled on a ' cracking captcha ' case, which became the first judicial decision in China to determine the nature of cracking captcha. However, this is not the first time that cracking captcha appears in the cases, and judicial practice did not criminalize it in previous cases. The author uses the ' cracking captcha platform ' as the keyword to search. At present, there are 14 cases involving the ' code platform ', but only two cases ( the first case of ' cracking captcha ' and the case of " Kuai-ah" platform) <sup>[5]</sup> directly investigated the criminal accountability for cracking captcha and convictions for ' the crime of Providing programs to hack into computer information systems '. In order to clarify the reasons, the author makes a comparative analysis of 14 cases.

On the one hand, in the existing cases, few defendants directly develop and operate the cracking captcha platform. Although most defendants have developed and produced corresponding software to provide technical support for other crimes, the realization of the function of "cracking captcha" is mostly through accessing and calling the existing third-party platform. Only the "small yellow umbrella " software and the " Kuai-ah" platform are developed by themselves, which is one of the reasons why there is little direct accountability for the cracking captcha itself in the existing criminal cases. On the other hand, the cracking captcha has its own particularity and does not constitute a joint crime with the upstream and downstream. Through the comparison of cases, it can also be found that before the first case of and " Kuai-ah" platform case, there have been many cases mentioned the use of third-party ' small yellow umbrella ' software or " Kuai-ah" platform, but in the judgment of these cases, there is no criminal responsibility for the relevant actors of the platform.

In other words, although these cases had accessed to or used the cracking captcha platform, due to the space-time barrier of the Internet, it is impossible to prove that the relevant actors of the cracking captcha platform have intentional contact with other defendants in the case, and they do not constitute a joint crime. The cracking captcha actor is not a party to the case, and cannot be investigated for criminal responsibility together.

## 1.2 The judicial status of cracking captcha

At present, there are only two cases in judicial practice that directly investigate the criminal responsibility of cracking captcha. As a typical precedent for investigating the criminal responsibility of cracking captcha itself, cracking captcha has been exposed to the public view and attracted widespread social attention and concern. The qualitative idea of ' the crime of providing programs to hack into computer information systems ' also has important reference significance and analysis value.

### 1. 2.1 Brief Introduction and Judgment Points of the First 'cracking captcha ' Case

The first case of “cracking captcha” mainly involves three defendants, Ye, Zhang and Tan. In January 2015, Ye wrote a scanning number software called “ Small yellow umbrella ” to log in the website account and password in batches. At the same time, the “Small yellow umbrella ” software was connected to the cracking captcha platform established by a large number of people organized by Zhang and gave Ye benefits. From January to September 2015, Tan used the “ small yellow umbrella ” software to successfully brush up 22,000 Taobao accounts, and then sold these illegally obtained accounts, totaling 250,000 yuan of illegal income. The defendants Ye and Zhang obtained 49050 yuan of illegal income by sellingcaptcha recharge cards to the defendant Tan.<sup>[6]</sup>The function of the recharge card is that only the purchase of the captcha recharge card in the Taobao store of ' Xiaocheng Store ' opened by Ye can use the ' Small yellow umbrella ' software to identify the captcha, so as to further complete the batch login behavior of Taobao accounts.

On May 18, 2018, the People 's Court of Hangzhou Yuhang District, Zhejiang Province, issued a judgment finding that the defendant Tan was guilty of illegal access to computer information system data ; the defendants Ye and Zhang provided special procedures for invading computer information systems, and the circumstances were particularly serious. The court believed that their actions had constituted the crime of providing procedures for invading computer information systems. Ye was sentenced to three years of fixed-term imprisonment, four years of probation, and a fine of CNY 40,000. Zhang was sentenced to fixed-term imprisonment of 3 years, suspended for 3 years and fined CNY 30,000. <sup>[7]</sup>

### 1.2.2The criminal qualitative logic of judicial practice on cracking captcha

The current judicial practice is still based on the idea of traditional joint crime, and the cracking captcha is regarded as an accessory to make evaluation according to the charges of the assisted behavior. The judicial authorities also respond to the relevant controversial focus.

#### ( i ) Reasons for adjudication by the judiciary

The criminal procedures and tools stipulated in paragraph 3 of Article 285 of the Criminal Law are mainly divided into two categories : one is specialized procedures and tools for illegal intrusion and control of computers ; the other is non-specialized procedures and tools for the implementation of such acts. In the first case of "database collision" , " small yellow umbrella " software has three main functions : firstly, it can constantly replace the IP address ; secondly, it can access the coding platform and break through the prevention of captcha ; thirdly, it can login and automatically grab Taobao account corresponding nickname, registration time, whether authentication and other information.<sup>[8]</sup>Without the authorization, the “ small yellow umbrella ” software can illegally enter the Taobao system and seize the relevant data and information. Therefore, the judicial authorities believe that the “ small yellow umbrella ” software can be determined to meet the requirements of “special procedures for intrusion into computer information system ”, which is regulated in Article 2 of Judicial interpretation on handling criminal cases endangering the security of computer information system promulgated by the Supreme People's Procuratorate and the Supreme People's Court. It has the function of breaking through the security protection measures of computer information system and obtaining the data of computer information system without authorization. In addition, because the confession and excuse of the defendants Zhang and Ye and the QQ chat records confirm each other, Zhang knows that the defendant Ye 's behaviour is to illegally log in a large number of network accounts, but still provides “cracking captcha” services. Therefore, the two people have the subjective intention of joint crime, constituting a joint crime. Defendant zhang constitutes the accomplice of the defendant Ye, which is also defined as the crime of providing programs to hack into computer information systems .

## **( ii ) Response of the judiciary to the focus of controversy**

First of all, software such as ' small yellow umbrella ' is a program that specifically invades computer information systems. Combined with the facts of the case and the function of the involved software, it can be concluded that it has the function of obtaining computer information system data without authorization or beyond authorization. Furthermore, the object protected by the offence of providing access to computer information systems procedures and tools is not limited to ' computer information systems in the areas of State affairs, national defence construction, cutting-edge science and technology ' listed in article 285, paragraph 1, of the Criminal Code.

Secondly, the captcha has the nature of ensuring the security of information system login. You can 't deny its essential core functionality since it can also be cracked under normal circumstances, or sometimes normal logins don 't pop up authentication code.

Finally, the batch crack of captcha has obvious criminal intention and is not technologically neutral. The key to identify the interest orientation of technology lies not in the technology itself, but in the subjective intention of technology developers and peaceful users. One of the main functions and purposes of the captcha is to identify and prevent automatic behaviors such as batch registration, login, and password recovery. Even if in the specific case that Zhang and Ye did not have contact , the people who crack the captcha should also realize that there is no demand for batch identification of captcha in the normal Internet business. Therefore, the defendant at least has certain expectations for the objective behavior of the aided person that may be suspected of a crime, and it can be determined that there is a subjective intention.

## **2. Reflections on the criminal nature of cracking captcha**

Cracking captcha is increasingly spreading in the network environment, and the harm is deepening. At present, although there are cases directly investigating the criminal responsibility of cracking captcha, there are few cases and lack of accumulated experience. There are other qualitative views exist in the academic circle as well.

### **2.1Doubts on the existing judicial decisions----crime of Providing programs to hack into computer information systems**

The case is special, and it cannot exhaust a specific manifestation of harmful behavior. The existing cases to provide the crime of intrusion into computer information systems do not mean that a unified qualitative conclusion is made on cracking captcha. The current referee lacks a separate analysis of cracking captcha, so that they are not complete and adequate evaluation.

#### **2.1.1The lack of independent evaluation of cracking captcha by the judiciary**

Taking the first case of ' database collision ' as an example, through the elaboration of the operation chain, it can be found that the cracking captcha platform is only an external part of the ' small yellow umbrella ' software, that is, the function and nature of the ' small yellow umbrella ' software are not equal to the code platform, and there are obvious differences. The judicial authorities generally summarize the code platform and the ' small yellow umbrella ' software, and use the reason of accomplice to carry out the overall qualitative analysis and ignore the attributes and characteristics of the cracking captcha itself. cracking captcha could and should be evaluated separately.

In fact, in most cases, cracking captcha does not constitute a joint crime with upstream and downstream behavior .In the case, if Zhang and Ye did not have intentionally contact and did not constitute a joint crime, Zhang should not be sentenced as the crime of providing intrusion computer information system program crime. Therefore, in this specific case, Zhang 's providing cracking captcha service constitute a

joint crime with Ye, and it is undisputed to be investigated criminal responsibility for the crime of providing intrusion into computer information system, in Paragraph 3 of Article 285 of the Criminal Law, but this must be based on the premise of constituting a joint crime. Although the judicial authorities have incorporated the cracking captcha into the scope of criminal laws and regulations, and the final qualitative results of this case are also more appropriate, the qualitative logic is actually flawed, lacking a separate analysis of cracking captcha itself, and still not finding a complete and appropriate qualitative idea for the particularity of cracking captcha itself.

### 2.1.2 Improperities to sentence as 'the crime of providing procedural offences against computer information systems'

As a kind of alienated helping behavior, cracking captcha needs independent evaluation. Although the crime of providing intrusion into computer information systems is a crime of helping convict, it is also inappropriate to use it to evaluate cracking captcha separately.

On the one hand, from the function of the cracking captcha platform, cracking captcha does not belong to the objective elements of this crime 'procedure'. The program crime of providing intrusion into computer information system includes providing 'specialized program' and 'non-specialized program' (neutral program). Firstly, the cracking captcha platform does not belong to 'specialized program'. In this crime, "the program specially used to invade computer information system" refers to the program specially used for the purpose of illegal crime, which has the function of avoiding or breaking through the security protection measures of computer information system, obtaining computer information system data without authorization or beyond authorization, or other programs specially designed for invading or illegally obtaining computer information system data.<sup>1</sup> Although the coding platform can crack or bypass the network security verification system, its own function is only cracking captcha, and it does not have the function of obtaining computer information system data without authorization or beyond authorization. It cannot independently invade the computer system or obtain computer information system data, which is inconsistent with the above definition. Secondly, the coding platform does not belong to the "neutral procedure" of the crime. The main purpose of this article is to distinguish between 'specialized' and 'non-specialized' procedures.

For the second 'non-specialized' program, it can be understood as a 'neutral program'. Such program design does not aim at illegality at the beginning, it can have other legitimate uses, only if the improper use will produce harmful consequences, what's more, only to collect sufficient evidence to confirm the actual use for illegal and criminal acts by other people, the provider can be identified as this crime, whose behavior is punishable.<sup>[9]</sup> Although cracking captcha cannot cause separate direct intrusion, control and damage to the computer information system like viruses and other programs, the main function and fundamental purpose of the platform is to crack the captcha that distinguishes human and machine, and help log in the account password in batches illegally. There is no possibility of legitimate demand and legitimate use of the technology. Therefore, cracking captcha cannot be identified as the second case of the crime.

On the other hand, from the nature of the coding platform itself, it is also inappropriate to directly identify the cracking captcha platform as a traditional computer program. The cracking captcha platform (here only refers to manual type) is mainly composed of two parts: one is other website platforms and

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<sup>1</sup> 2011 Interpretation of the Supreme People's Court of the Supreme People's Procuratorate on Several Issues Concerning the Application of Law in Handling Criminal Cases against Computer Information System Security Article 2, paragraphs 1 and 3.

software carriers ;the second is a large number of people that input captcha. Although the former belongs to the category of computer programs, it is only the channel and operation carrier of access network, the latter is the main body to play a practical role. In short, the large number of ' workers ' implementation of ' cracking captcha ' is the key part of direct infringement of legal interests. The current judicial interpretation does not make a specific explanation for the category of ' procedure ' in Article 285 ( 3 ) of the Criminal Law, but it still tends to default to the conventional computer code program. Therefore, there is a significant difference between the manual operation form that consist of a large number of workers and the procedure referred to in this crime.

## **2.2 Critique of the corresponding viewpoints in the academic circles - - adding the crime of impairing business**

The cracking captcha platform provides services that break through or bypass the network captcha mechanism, interferes with the normal function of the network and protection measures, and hinders the Internet business. Therefore, some scholars argue that we can learn from the provisions of other countries such as Japan on the crime of obstruction of business, and add the crime of obstruction of business in chinese criminal law to evaluate acts as “cracking captcha ”. But this view is not necessary and unreasonable no matter from the crime itself or the actual utility of solving the problem of cracking captcha.

### **2.2.1 Non-necessity of adding crimes against business**

In the current environment of China, although there is a need and necessity to protect business activities and equal protection of legal interests, the timing of adding crimes against business is not mature. The regulation of cracking captcha should still give priority to finding appropriate solutions from the existing accusation system.

#### **(i) The nature of crimes of obstruction of business is not suitable for China 's legislative status**

As for the crime of obstruction of business, Japan ' s criminal law actually identifies it as a category of charges. At first, it is stipulated in six articles in the way of limiting specific economic activities. Then, Japan's new criminal law stipulates it in Chapter 35, “ Crimes against credit and business ”. Finally, the existing legislative models of “ Crimes against business by deception ”, “ Crimes against business by power ” and “ Crimes against business by damaging electronic computers ” are formed.

Some scholars believe that this crime does not need to be subdivided so that the three subdivided charges can be combined as counts, and only one crime of obstruction of business can be established. However, in fact, this method cannot essentially change its typological nature, and the crime of obstruction of business still has an abstract and general expression. The success or failure of legislation and legal discovery depends on whether the type can be correctly mastered.<sup>[10]</sup> However, due to the fact that the typification of information network criminal legislation in China does not distinguish information network criminal behavior from the characteristics of simplification, immobilization and visualization of traditional criminal behavior, there are still many problems and limitations in the typification of legislation, and its adjustment needs a comprehensive consideration and long-term gradual process.<sup>[11]</sup> Therefore, it is difficult to integrate the current separate crime of obstruction of business with the existing accusation system ,which cannot achieve the desired effect and purpose.

#### **(ii) The crime of obstruction of business is controversial between actual offense and concrete dangerous offense**

So far, in Japan,there still exist the dispute that the crime of disrupting business is an actual offense or a concrete dangerous offense. Japan ' s judicial organs believe that as long as the act of impairing business is implemented, it can constitute a crime of impairing business without requiring the result of impairing

business occurring. However, this is actually due to the difficulty in identifying the harm result of impairing business, so the judicial organs have to identify it as a specific dangerous crime. From the perspective of ought-to-be, it is more appropriate to use the actual offender to identify the crime of obstruction of business. On the one hand, the direct harm of the means of doing harm to the business itself is small, mainly through tricks and threats, the infringement of legal interests is weak ; On the other hand, it is easy to confuse the crime of obstruction of business with a large number of similar banter behaviour, which can easily lead to excessive expansion of interpretation of behavioral elements. As Professor Yamaguchi said, ' In the case of a crime of obstruction of business, the element of obstruction of business may become the only element limiting the scope of punishment for this crime in the context of the expanded interpretation of the means of obstruction by jurisprudence and doctrine.<sup>[12]</sup> Because there are few special charges for cyber crime in Chinese criminal system, most of them adopt the method of expanding the interpretation of traditional charges, and there is a phenomenon of excessive interpretation. Therefore, the potential dangers of excessive expansion of the scope of punishment for business crimes will be more prominent in China. Through the analysis of recent cases of new network crime, such as cracking captcha, malicious registration, reverse brushing, "Huabei" defrauding the cash and so on, it can be found that these acts will actually involve the harm to the normal operation of the Internet business, but the specific behavior of each case and the most important legal interests are different. If they are classified as the crime of impairing the business, only by virtue of having the harmful results of ' impairing the Internet business ', it will cause great damage to the current conviction and sentencing standards in China. Therefore, if the crime of disrupting business is added in our country, it will not only face the contradiction and embarrassment of actual offense and concrete dangerous offense, but also cause more serious adverse consequences.

### **( iii ) Priority to the application of existing ' criminal law ' charges in China**

The author does not deny that in the future, legislation can add other appropriate new charges to adjust such specific legal relations, and regulate them effectively . However, the law is ultimately lagging behind, and both legislation and justice are historical and specific. It is neither feasible nor desirable to have one act and one charge. When there are thorny new problems in practice, the first response should not always be adding and introducing new charges, but use the existing charges at this stage to seek the most appropriate and accurate solution, so that the existing legislation can maximize its effectiveness, and the discussion on the qualitative nature of cracking captcha should also be like this.

#### **2.2.2 The irrationality of charging cracking captcha as the crime of impairing business**

There is a deviation between the crime of disrupting business and the protection of legal interests of cracking captcha. The ' Japanese Criminal Law ' stipulates the crime of disrupting business in Chapter 35 ' Crimes against Credit and Business '. Articles 233 and 234 stipulate that those who spread false rumors or use tricks to disrupt other people ' s business or use power to disrupt other people ' s business are punished for the crime of disrupting business. As computers are widely used in various operations, Japan has also added in article 234 bis offences against operations such as damaging electronic computers. The provisions of ' Korean Criminal Law ' are in fact the same as those of Article 233 of ' Japanese Criminal Law ', and Article 313 stipulates that the dissemination of false facts or other fraudulent means impairing the credit of others constitutes the crime of impairing business ; article 314 stipulates that the method or violence of the previous article, which impairs the business of others, constitutes the crime of impairing business. In addition, Article 513 of Italian Criminal Law and Article 328 bis of Dutch Criminal Law have similar provisions. In terms of the legal interests protected by the crime of obstruction of business, it is difficult to determine it. ' Since the criminal law has no clear basis in the method of regulation, the



nature of the crime of obstruction of business or the protection of legal interests are quite ambiguous'.<sup>[13]</sup>At present, the views of Japanese academic circles can be divided into three kinds. One is that the crime of impairing business is a crime specifically aimed at property.<sup>1</sup>Second, the crime of impairing business violates the freedom of the business executor's will and activities.<sup>2</sup>The third is eclecticism, which believes that the crime of impairing business has both the attribute of infringing property and the attribute of infringing on the freedom of business activities of others.<sup>3</sup>

Cracking captcha is the barrier for the security protection of the current landing computer information system, which can distinguish between human and computer to further verify the identity of the current operator. Therefore, captcha has actually become a security management method and procedural guidelines that people follow in the current network society to maintain and guarantee the stability of the cyber space order. Cracking captcha destructs the function of captcha, interferes the existing network space management and breaks the orderly and stable state. That is to say, the harm of cracking captcha is not limited to personal property losses or freedom of business activities, its fundamental harm is to a kind of social management order. Chinese Criminal Law Chapter 5 refers to the legal interests of the management order, means the social life must abide by the code of conduct and national management activities to adjust the social model, structure system and social relations of order, stability and continuity. Different from the legal interest in the crime of impairing business. In addition, the most prominent feature of cracking captcha is that it still provides help even if it does not constitute a joint crime with the aided person. The keyword is "help", and the crime of impairing business cannot reflect it accurately.

### 3. A new perspective on the criminal nature of cracking captcha

At present, the main way of cracking captcha is to break up the link with the upstream and downstream of the industrial chain under the pretext of unintentional contact, which belongs to a kind of behavior of 'hiding ears and stealing bells'. Disconnecting the contact of criminal intention does not change the existence of the perpetrator's own criminal intention and does not affect the nature of the crime, but it should take another form of conviction. Therefore, the complete evaluation of the formation of cracking captcha should distinguish and discuss whether there is criminal intention.

#### 3.1 Charge the behaviour separately in the case of no joint crime exist - the crime of assisting information network criminal activities

In the vast majority of cases, the people who crack the captcha has no contact of criminal intent with the act aided people, or it is difficult to establish conclusive evidence of the contact of criminal intent. The crime of helping information network criminal activities is the basic miscellaneous charges added in line with the trend of taking assisting behavior as principal offender, under the circumstance that the harm and independence of helping offenders are enhanced in the network environment. This crime can better

<sup>1</sup> The Japanese representative scholars who hold this view are Miyamoto: 'Outline of Criminal Law (each theory)', Hongwentang Book Room 1934 edition, p. 410-411; fujimoto: 'Lectures on Criminal Law', Hongwentang 1976 edition, p. 249; shankouhou: 'criminal law theory (second edition)', Fige 2010 edition, p. 155.

<sup>2</sup> The Japanese representative scholars who hold this view mainly have Mucun Gui Er: 'the theory of criminal law', Qinglin Academy 1957 edition, p. 76; pingye Longyi: 'Introduction to Criminal Law', Tokyo University Press Conference 1977 edition, page 185; dagushi: 'Lectures on Criminal Law (3rd edition)', Fige, 2015, p. 137.

<sup>3</sup> The representative scholar of Japan who holds this view is Komatsuya: 'Introduction to Criminal Law (various theories)' (third edition), translated by Feng Jun, People's University of China Press 2003 edition, p. 158.

evaluate the independence of cracking captcha in the network environment and avoid the deviation of legal interest protection. However, the current defects in the application of this crime weaken its regulation of online help behavior and should be further expanded to improve the scope of its sanctions.

### **3.1.1 The legislative background and system orientation of the crime of helping information network criminal activities**

The continuous evolution of information network crime makes the help behavior present new characteristics, which cannot be evaluated by the traditional accomplice theory. On the one hand, the network help behavior has the characteristics of 'one-to-more', and the overall harm of the help behavior is huge, but the harm of the individual who is assisted does not reach the quantitative standard of a crime. Under the legislative mode of the coexistence of illegality and dual crime in our country, the criminal acts stipulated in the current criminal law are the unity of quality and quantity. Many acts can only be established after reaching certain quantitative standards.<sup>[14]</sup> On the other hand, the network help behavior has a strong feature of independence, it does not depend on the aided behavior both in subjective and objective term, providing technical assistance between the perpetrator and the aided behaviour do not have intentionally contact, and do not need to have intentionally contact, the behavior of both do not have simultaneity and there is no need to cooperate. The addition of the crime of helping information network criminal activities is based on the important background of the alienation of the network helping behavior. On the basis of the introduction of the one-sided accomplice and taking assisting behavior as principal offender by judiciary, it further clarifies the idea of taking assisting behavior as principal offender in legislation, so as to tighten the legal network and fill the gaps and loopholes in the evaluation of criminal law.

However, it needs to be clear that for the overall regulation of all helping behaviors in criminal law, the traditional accomplice responsibility is still the basic responsibility, and the crime of helping information network criminal activities can be regarded as a supplementary principal responsibility. When there is clear evidence that the assisting actor has intentional contact with the aided person and constitutes a joint crime, it should still be defined as the crime of perpetrating act according to the traditional theory of joint crime. The crime of helping information network criminal activities is mainly aimed at the alienation of helping behavior in cyber crime, which is applied only when the joint crime cannot be evaluated. If the act of assistance constitutes other crimes at the same time, it shall be characterized as a heavier offence under article 287 bis, paragraph 3, of the Criminal Code, in accordance with imaginative concurrence.

### **3.1.2 The integrity and accuracy of the crime of helping information network criminal activities to evaluate cracking captcha**

The crime of helping information network criminal activities regulates the behavior that is difficult to use traditional accomplice theory. It can be consistent with the essential attribute, independence, and the infringement of legal interests of cracking captcha. It can reveal the true criminal intention concealed by it and achieve accurate evaluation of the criminal responsibility.

(i) The nature of cracking captcha is a behaviour

Cracking captcha studied in this thesis is a kind of helping behavior to provide technical services, and its essence is still a kind of "behavior". Cracking captcha itself is not a software, platform or program. In the process of retrieving the keyword of the case, it can be found that to input 'cracking captcha behavior' as the keyword cannot produce results, and the input of the 'cracking captcha platform' can display the relevant cases. In other words, the expression in the current judicial practice is easy to bring misunderstanding to people, and it is considered that the cracking captcha is a platform or procedure.

On the one hand, from the perspective of function, the function and role of cracking captcha is to crack

the captcha security system. Although the operation and implementation of cracking captcha are usually inseparable from the relevant platforms and software, and the recruitment of “workers” and the issuance of related tasks are also carried out through the network platform, they only use these software and platforms as the carriers of behavior. These software and platforms do not have the function of “cracking” themselves, and their main purpose is not “cracking captcha”. On the other hand, in terms of the operation of cracking captcha, it cannot be considered to a platform or program. Cracking captcha is manually input and cracked by ‘agent’ who organize a large number of workers. It is not an algorithm, nor is it a kind of software and virtual network platform. Therefore, to regard cracking captcha as a platform or program is a cognitive deviation of its own composition and operation mode.

( ii ) The crime conforms to the independence of cracking captcha

The subjective intention and objective behavior of the cracking captcha is independent of the aided people who is assisted with the upstream and downstream of the industrial chain. The conviction and sentencing of the cracking captcha is also independent of whether the assisted behavior constitutes a crime. The crime of helping information network criminal activity is suitable for helping behavior that cannot constitute a joint crime. It can realize a separate evaluation of helping behavior and cover up the situation that the traditional joint crime theory can not regulate. It is correspond to the characteristics of cracking captcha and solve its qualitative problems. Therefore, in terms of the first case of “ database collision ”, if Zhang and Ye are lack of intention contact and have no specific chat, Zhang does not know the specific criminal activity of Ye ,which is providing Taobao website scanning software, or if Zhang organizes workers to crack captcha did not based on the Ye ’ s commission, then Zhang cannot be charged as having the joint intention of providing procedures for intrusion into computer information systems, and it can only be evaluated according to his own behavior independently, which is charged as the crime of helping information network criminal activities.

( iii ) The charge corresponds to the legal interest of ' code ' violations

The crime of helping information network criminal activities is in the first section of chapter V of ' Criminal Law ' and belongs to the crime of disturbing public order in the crime of impairing social management order. Good and stable public order is the legal interest protected by it. The development of Internet technology has contributed to the formation of the current ' two-tier society '. Like traditional society, cyber space needs identity verification and access to ensure the safety of public order. The program composed of account, password and captcha plays such a role. Among them, the most important role of captcha is to distinguish the real person from the computer, prevent the people behind the screen from illegally obtaining and logging in the account and password of others and implementing other illegal behaviors. Therefore, it seems that cracking captcha is not harmful since it only input the captcha in batches, but in fact, its damage is not limited to the personal user's experience feelings and information property security, nor is it the business of Internet companies, but the management mechanism and security order at a deeper level of network society. Therefore, the crime of helping information network criminal activities can also fit the legal interests well enough.

### 3.1.3 Specific Application and improvement of the Crime of Helping Information Network criminal activities

In October 25th,2019, the Supreme People 's Court and the Supreme People 's Procuratorate jointly issued the Interpretation on Several Issues Concerning the Application of Law in Criminal Cases such as Handling the Illegal Use of Information Network and Helping the Criminal Activities of Information Network ( the following referred to as the Interpretation ), which is consistent with the original purpose of adding the Crime of Helping the Criminal Activities of Information Network in legislation , and

combined with relevant practical experience, made clear provisions on the determination of such issues as " knowing " and " aided people constitutes a crime. "[15] The content of ' interpretation ' has dealt with and improved some applicable problems existing in the crime, but there are still some limitations.

#### **( i ) Defects in Article 287 bis of Criminal Law**

Article 287 bis 2 of ' Criminal Law ' adopts the expression of ' knowing that others use information network to commit a crime ', that is, to constitute the crime of helping Information Network criminal activities, the specific aided behaviour has to constitutes a crime, and the aid person should know that the behavior that he helps may involve a crime. Therefore, although the crime of helping information network criminal activities has taken the legislative idea of taking assisting behavior as principal offender, the constitution of the crime still require the aided behaviour constitutes a crime as a prerequisite , which limits the effectiveness of the crime in practice. The regulation of the crime of helping information network criminal activities is just the aid behavior that cannot be evaluated by the traditional joint crime, since thers is no joint crime exists. On the one hand, it is because the aid person has no intention contact with the aided person. On the other hand, it is because the single perpetrator may not meet the crime quantity standard , even if it reaches the level of crime, it may also difficult to convict and sentence the aided behaviour since the lack of evidence of determining the perpetrator, or the perpetrator has special circumstances that can not meet the offender requirement .

If the aided behaviour must constitute a crime, then through the one-sided accomplice theory can solve this problem, therefore, aided behaviour constitutes a crime as a standard of the crime, will not only weaken and fuzzy the characteristics of independence , contrary to the legislative intent, but also cause the application of principal offender responsibility and one-sided accomplice responsibility become contradict and confusing , if the concept of one-sided accomplice was fully introduced by legislation or judicial in the future , the crime of helping information network criminal activities will be virtual, lost the necessary of application.

#### **( ii )The Expansion and limitations of the latest ' interpretation '**

The new ' interpretation ' reflects the idea of expanding interpretation, but its expansion for the crime of helping information network crime is still very limited and conservative. First of all, article 12, paragraph 2, further clarifies the ' standard of incrimination ' of this crime and provides special circumstances. When met the following two conditions ,the constitution of this crime may not require the aided person constitutes a crime as well: one is that it is difficult to verify whether the person being helped has reached the level of a crime, due to the restriction of objective conditions; the other is that the amount has reached more than five times the prescribed standard or has caused particularly serious consequences. There exists two problems . On the one hand, the fact that judiciary does not require aided person constitutes a crime is set out in article 12, paragraph 2, as ' exceptional circumstances ' ,and articles 11 and 12, paragraph 1 of the ' interpretation ' , still adopt the expressions of ' providing technical support or assistance for the commission of a crime by others ' and ' knowing that others use information networks to commit a crime and still provide assistance ' ,means that the current judicial practice continues to require aided person constitutes a crime in general. On the other hand, the situation ' do not require the aided person constitutes a crime ' regulated in the provisions , including only because the objective conditions can not verify whether the aided behaviour achieve the degree of the crime, which reflects the value orientation of the current judicial interpretation, that is, they tend to believe that the aide person has achieved the degree of crime , only when it is difficult to verify the crime then the appropriate relaxation is given, if the implementation of the behavior of the person to be verified in the quantitative did not achieve the degree of crime, then help the aided person still can not constitute the crime of helping information network

criminal activities.

Secondly, Article 13 of ' Interpretation ' stipulates that if the aided person has not yet arrived at the case, the judicial authority has not yet made a judgment in accordance with the law, or because of the age of criminal responsibility and other main conditions limit not to be investigated for criminal responsibility in accordance with the law, it can still be identified as helping the perpetrator constitutes the crime of helping information network criminal activities, so that the criminal responsibility of helping the aided person is not affected by the conviction and sentencing of the assisted behavior. However, this article still takes ' the criminal behavior of the assisted person can be confirmed ' as the premise, ' the confirmation of criminal behavior ' only refers to the nature of the behavior or still needs to reach the quantitative standard, and there is no clear explanation.

Finally, Article 11 of ' interpretation ' clarifies the identification of ' knowing ' of this crime, specifically summarizes seven situations, and plays a guiding and improving role. However, the judicial interpretation here adopts the method of listing the behaviors of helping behaviour, and there is still a lack of unified definition and summary of the standard of " knowing " of aid person from the perspective of cognitive content. For such an independent helping behavior as cracking captcha, the offender does not need to subjectively recognize the specific behavior of the aided person. As long as the offender knows that the helping behavior may be a crime in the objective nature, it can be regarded as reaching the subjective knowing standard of the crime of helping information network criminal activities.

### **(iii) Improving methods of Judicial Interpretation in the Future**

The judicial authority should better play their judicial initiative on the existing basis, and further expand the interpretation of " crime " in the crime of information network criminal activities in the future judicial interpretations, so as to expand the scope of sanctions. For this crime, the aided behavior is not necessarily constitute a crime, and don't have to consider the special factors of quantitative and subject, it only supposed to have the objective nature of the crime , in the interpretation, the crime here is a kind of behaviour that has the nature of objective aspect of the charges in criminal law and does harm to the society , that is no longer to interpret the concept of the crime strictly. In addition, as for the level of subjective understanding, according to the cognitive level of the general person, as long as the offender can realize that the behavior he helps may be suspected of a crime, and know that he may help the aided person implement the behavior prohibited by the criminal law, he has reached the standard of conviction. It should be noted, however, such an expanded interpretation does not mean that the illegal behaviour in administrative law is confused with the criminal activities, and that even if the aided behaviour does not actually reach the quantitative level of the crime, the aided behaviour is required to be able to find the corresponding type that regulated in the criminal law, not all illegal aided behaviour can constitute the crime of helping the information network criminal activities.

Furthermore, the expansion of the interpretation of the term ' crime ' in the provisions of the criminal law does not exceed the possibility foreseen by ordinary nationals and is already reflected in other charges. For example, in theory and cases, ' the crime of spreading obscene goods ', ' the crime of spreading obscene goods for profit ' and ' the crime of providing programs and tools for invading and illegally controlling computer information systems ' have precedents for interpreting their ' predicate offences ' or the nature of assisted behaviour as ' illegal behaviour ', and the ' interpretation ' has also referred to the relevant provisions of these charges. [Reference from the 2010 ' Supreme People ' s Court, the Supreme People ' s Procuratorate on the use of the Internet, mobile communication terminals, radio production, reproduction, publishing, trafficking, dissemination of obscene electronic information criminal cases specific application of law interpretation of several issues ( II ) ' Articles 4,5 ; article 9 of the Interpretation

of the Supreme People 's Court of the Supreme People 's Procuratorate on Several Issues Concerning the Application of Laws in Criminal Cases against the Safety of Computer Information Systems. ]These examples further confirm the rationality and feasibility of the expanded interpretation of ' crime ' in the crime of information network criminal activities.

### **3.2 The charge of cracking captcha in the case of joint crime**

Compared with the traditional accomplice, cracking captcha does not need to have intentional contact with the aided person in general. However, in order to achieve a full and effective evaluation of cracking captcha , it cannot be ignored that in specific cases, there is a situation that there exists intentional contact with the aided person. In this situation, it should still be evaluated through the accomplice responsibility with a basic status.

#### **3.2.1 The basic status of accomplice responsibility to regulate the helping behaviour of the cyber crime**

The traditional accomplice responsibility is still the basis of the evaluation system of helping behavior. The type of crime that taking assisting behavior as principal offender, including the crime of helping information network criminal activities, is applied only under the premise of the joint crime does not exists. The principal responsibility cannot replace the status and role of accomplice responsibility. Firstly, the maximum statutory penalty of the crime of helping information network criminal activities is not enough, and it is difficult to evaluate the more serious crimes that are more harmful ; Secondly, the essential attribute of helping behavior in cyber crime is still to provide help. Although the crime that taking assisting behavior as principal offender can fill the vacancy of the separate evaluation, it also weakens the attributes and characteristics of the helping behavior itself. <sup>[16]</sup> If there is evidence to prove that there exists criminal intention contact with the aided behavior, it can constitute a joint crime. Many aided behaviors can fully reflect the nature of their specific criminal behaviors under the joint crime responsibility, and achieve the most accurate evaluation.

In addition, in the evaluation of accomplice liability, the network-assisted crime shows the trend of principal offender. Article 27 paragraph1 of the current ' Criminal Law ' stipulates : ' Anyone who plays a secondary or auxiliary role in joint crime is accessory. ' In Chinese criminal law system, helping offender and accessory are two concepts of overlapping scope, which cannot be equated. With the alienation of network helping behavior, its overall harmfulness is far more than that of each specific aided behavior. Therefore, the evaluation of the judicial authority on helping offenders cannot be limited to the original reality. The cognition and application of traditional theories should be updated, and the main offender should be directly identified for if the helping behavior plays a major and key role in joint crime cases that it should be regard as principal offender.

#### **3.2.2 Charge cracking captcha as the crime of aided person.**

In specific cases, if there is evidence to prove that the cracking captcha and the upstream and downstream behaviour constitute a joint crime, then the cracking captcha should still be in accordance with the traditional accomplice theory, to be charged as the crime of aided person in a role of helping offender . In the current judicial decisions, the judicial authority exactly charge cracking captcha as the crime of providing programs for intrusion into computer information systems according to this idea.

On the premise of constituting an accomplice, besides the crime of providing programs for intrusion into computer information system ,cracking captcha may also be charged as other crimes in accordance with the aided person, but they cannot be directly and separately charged as these crimes. Taking the crime of destroying production and operation as an example, article 276 of the Criminal Law stipulates the corresponding elements constituting the crime. If the cracking captcha has intentional contact with the

aided person, it is correct to define it as the crime of destructing the production and operation according to the crime of aided behaviour. However, when the cracking captcha needs to be evaluated separately, there are obvious problems in defining it as a crime of destructing the production and operation : firstly, cracking captcha itself does not directly target specific enterprises ; secondly, the cracking captcha does not have any direct specific damage to production and operation. Thirdly, the crime of destructing production and operation focuses on the protection of property rights and interests, and there is a deviation from the public order legal interests damaged by cracking captcha ; Finally, cracking captcha obviously does not belong to such behavior as ' destruction of machinery and equipment, damage to livestock ' , to interpret as ' other methods ' also violate the rules of similar interpretation.

#### **4. integrative solution to the helping behaviour of destroying cyber security verification system**

The development of technology has two sides. Security protection and cracking attacks have an opposite relationship between each other. The contradiction between ' attack ' and ' defense ' of network security verification system has become increasingly prominent. Cracking captcha is not a separate special case, but only an example of the current helping behaviors to crack the network security verification system. The currently spreading face recognition behaviour and the future evolution of AI cracking captcha are also typical representatives. Such similar cases should be connected in series at the legal level, and seeking the integrated solution should be focused.

##### **4.1 Regulation of substituted face recognition behavior**

At present, many APP applications have the function of face authentication. Face recognition has become a ' new cake ' stared by black industry practitioners. Substituted face recognition has also become a black industry chain, and has developed as a criminal group. The risk caused by substituted face recognition has attracted more and more attention of the society, and the judicial authority should give a clear response to the regulation of this problem.

##### **4.1.1 The prevalence of substituted face recognition**

At present, ' Tantan ', ' 58 Tongcheng ', ' Ganji Network ' and other social software, have become the main object of substituted face recognition of black industry, due to the large social interaction demand of users. The people who provide substituted face recognition technology services generally only give WeChat or QQ numbers and require buyers to add by themselves to get relevant contacts and transactions in order to avoid platform supervision. A common operation principle of substituted face recognition is to set a face photo on the action script by software and make a video in MP4 format, so as to bypass the face recognition authentication of the service provider. The actor will prepare the corresponding action scripts in advance, such as " blink – shake head – blink – nod " or " mouth opening – shake head – mouth opening – nod ". After the face photos are imported into the software and the key points of the face such as eyebrows and corners are marked, the original two-dimensional face images can make a series of pre-set actions according to the scripts, so as to generate a virtual video, and then through the method of "brush machine"<sup>1</sup> to hijacked the front camera of the mobile phone and forced it to be changed into the MP4 format that has been completed. Even in the face of a higher level of face authentication and defense measures, the hacker port also appeared to update the technique, that is, the hacker directly black out the camera, use the security vulnerabilities between the camera and server when catch the face images , and then it can steal the network flow and achieve the purpose of cracking, this

<sup>1</sup> brush machine , it refers to changing or replacing some languages, pictures, bells, software or operating system that originally exist in the mobile phone through certain methods. Generally speaking, the brush machine is to refit the phone system.

kind of behavior is more difficult to defense.

The spread of face recognition behavior has brought many serious risks. In the operation process of substituted face recognition, black industry practitioners need a variety of ' materials ', including identity photos, identity cards, names and account passwords. Therefore, behind this behavior also hides the information trade industry chain, user portraits and identity and other important personal information have serious leakage risk. After passing the face recognition, in addition to the purpose of self-satisfaction, these leaked information may also be used by other actors to lend, register companies or even solicit prostitutes, or extort, humiliate, harass and blackmail victims, causing direct personal and property loss of the victims , and damaging the trust of Internet users and the security order of the network environment.

#### **4.1.2 The criminal charge of substituted face recognition behavior**

Substituted face recognition is associated with a series of violations of personal information of citizens, which is a black industry chain of data information. However, as far as the behavior of substituted face recognition itself is concerned, it is still a helping behavior of providing technical service to deceive the camera by using pre-edited videos. Similar to cracking captcha, although the behavior is only to use the users' information illegally obtained from others to make ' virtual video ', it does not participate in the upstream illegal activities to obtain the users' personal information, and does not know the downstream subsequent specific behavior. However, the offender of substituted face recognition still have a generalized cognition of the objective nature of the crime of aided people's behavior, and they can be regulated by the crime of helping information network criminal activities according to the idea of taking assisting behavior as principal offender. In addition, it should be noted that if the person who provides substituted face recognition service has intentional contact with the aided people in a specific case, it should still be convicted and sentenced in accordance with the traditional idea of joint crime and the charges the offender the same as the crime of aided people.

#### **4.2 Response to the evolution trend of AI cracking captcha in the future**

AI cracking captcha will become the main trend of cracking captcha in the future, with new characteristics different from manual mode. However, the current artificial intelligence with the function of cracking captcha does not have human mind, and it should still return to the accountability of natural persons behind at the judicial level.

##### **4.2.1 The Development characteristics of AI cracking captcha**

The deep learning technology and multi-label training method used in AI cracking captcha make the computer recognize and crack the captcha with high speed and high accuracy, which destroys the original intention of the function and application of the captcha and has a higher social harmfulness. At the same time, due to the characteristics of applying AI technology, it also brings new difficulties to the judicial detection and trial.

( i ) AI cracking captcha originate from Deep Learning Technology of Convolutional Neural Networks

The early platform of cracking captcha , the recognition of captcha is based on the technology of ' artificial + OCR '.<sup>1</sup> The efficiency of ' artificial + OCR ' recognition method is low, and the cost is expensive. Black industry personnel have taken a more cutting-edge approach to deal with it, that is, using

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<sup>1</sup> OCR ( optical character recognition ), is a kind of image file analysis and processing, the text on the image is converted to text technology. The recognition of character captcha can be classified as a kind of OCR applications. Through OCR technology, the characters in the captcha picture are converted into words, so as to achieve the purpose of automatic identification of captcha by computer.



the Deep learning technology of Convolutional Neural Networks ( CNNs )<sup>1</sup> to establish a simulated human brain analysis learning neural network. Deep learning mainly uses a multi-task learning ( MTL, Multi-Task Learning ) mode to learn multiple supervised information ( labels ) given by data. For example, it is a multi-task classification problem to simultaneously identify the location, expression, gender and age of the face in an image, or to simultaneously identify the location, color and vehicle type of the vehicle in the image. The feature of decoding the character of captcha based on deep learning recognition is that only a suitable network model needs to be defined, and sufficient labeled samples are trained then much higher recognition effect than traditional methods can be achieved. No matter what form of the captcha or whether it is interfered, it will not affect its identification, so it is not necessary to mediate the threshold of the captcha under different modes. In addition, the neural network itself has a strong generalization ability. For different styles of captchas generated by different means, only a large number of training samples of this type are collected or generated to join the training, and a high recognition rate can be maintained towards the captcha generated in different ways.<sup>[17]</sup> ' Kuai-ah ' platform is a typical example of AI cracking captcha by using deep learning. IT based on the mainstream AI deep learning Caffe framework.<sup>2</sup> The vgg16 convolution kernel neural network model is used to directly input the original image ( avoiding the complex pre-processing of the image ), which greatly improves the accuracy and speed of the identification of captcha. There are three steps in the deep learning and training mode of ' kuai-ah ' platform using AI system. Firstly, obtaining massive captcha training data quickly and cheaply. Secondly, the multi-task label training is carried out. Finally, the feedback failure samples and the calibration data of manual code are collected and optimized.

( ii ) The root damage of AI cracking captcha to the function of captcha

In June 2017, criminal sanctions were imposed on the ' kuai-ah ' platform, the largest online character captcha cracking platform in the market. The statistical information of the background management of the ' kuai-ah ' platform shows that from January to March 2017, the number of cracking captcha reached 25.9 billion times, and the cumulative number of cracking captcha totally on the platform was more than 170 billion times. The overall recognition rate of captcha in one day can reach 83.4 %, which provides efficient and massive help and convenience for downstream criminal activities such as library collision, trafficking in citizen information, and accurate network fraud.

Thus, compared with manual method, AI cracking due to the use of ' deep learning ' artificial intelligence technology to train, the efficiency and business volume of cracking captcha get exponential growth, its higher speed, larger number, lower cost and higher accuracy, greatly enhance the destructiveness and harmfulness of cracking captcha. Moreover, the fundamental purpose of captcha is to distinguish between the human brain and the computer, manual method is still operated by the workers, and there is no blurring of the boundaries between the human brain and the computer. However, the AI cracking destroys the root of captcha, which means that the computer can also accurately identify the captcha through a large number of learning and training, and even more quickly and accurately. This makes the function of captcha fundamentally challenged, which will pose a great threat to the security of Internet users, trust and the security management order of the whole network environment, and even affect the trust and stability mechanism of the national network space.

<sup>1</sup> Artificial Neural Networks refers to abstract the human brain neural network from the perspective of information processing, establish models, and form different networks according to different connection methods.

<sup>2</sup> Caffe, Convolutional Architecture for Fast Feature Embedding, is a deep learning framework with expression, speed and thinking modularization.

(iii) AI cracking captcha increases the difficulty of judicial authority to handle cases

The particularity of AI cracking captcha also greatly increases the difficulty of judicial authority in handling such cases. First of all, AI cracking captcha, with the help of the technical and virtual nature of the network, can well conceal its own traces of behavior, so that the judiciary cannot directly trace them. Secondly, AI cracking captcha has the characteristics of “ one-to-many ” help. The perpetrators who receive the help are scattered throughout the country, and there is a huge geographical difference which is difficult to file and track. In addition, the offender usually has no intentional contact with the aided people, and intends to separate the direct connection between the helping behaviour and the upstream and downstream behaviour of the industrial chain, which undoubtedly causes greater trouble in the forensics process. Moreover, as for the crimes related to the use of AI technology, judicial personnel are extremely lacking in technical operation and practical experience. Only with the joint assistance of forensics and professional and technical practitioners can restore and sort out the process of the case, but the efficiency interference and cost of justice will increase as well.

Finally, crimes involving AI has been controversial in criminal law theory, so how to apply the current theory and charges is also a more difficult problem.

#### 4.2.2 The accountability of qualitative return to natural persons at current stage

The theory of criminal law has different characteristics in different era, which always needs to adapt to the crime governance in a specific historical development stage. Artificial intelligence crime theory has no exception, also need to be based on the development of artificial intelligence and social development stage to build and expand.<sup>[18]</sup>

(i) The current development stage of elementary weak artificial intelligence

At this stage, although the development of artificial intelligence has caused an impact that cannot be ignored on traditional models and theories, the ability of artificial intelligence to conduct independent behavior and thinking is still relatively limited. The discussion on the criminal responsibility of artificial intelligence cannot leave the current stage of the current development of elementary weak artificial intelligence. As some scholars argue : ' Unlike the social and cultural attributes of human , the essential attributes of AI are natural and mechanical. AI replicates and strengthens the material basis and partial functions of brain thinking. It only executes human instructions without considering social significance, social responsibility and social consequences, so it cannot form the real practical activities and social attributes. <sup>[19]</sup> Although the development of artificial intelligence technology in the future will certainly break through this situation, however, it will experience a long time span. At present, the definition of artificial intelligence is still defined by machines, namely, ‘ things ’. <sup>[20]</sup> As far as AI cracking captcha is concerned, although it uses the deep learning technology of simulating human brain. After a lot of training, the computer has a similar effect as the human brain in identifying captcha, which is a separate aspect, but it is only a function of the object. It cannot be equated to the human brain only because this function is similar to the human brain, and it does not have the corresponding consciousness fundamentally. In other words, artificial intelligence is a robot that simulates and extends ' human intelligence to complete crack captcha '. Although it has considerable intelligence, it does not have human mind and spirit, and cannot be simply equated with natural people who own the ' human intelligence '. <sup>[21]</sup> Therefore, it is immature and unreasonable to directly investigate the criminal responsibility of artificial intelligence itself at this stage. The most reasonable way to solve the current AI crimes such as AI cracking captcha is to expand and extend the responsibility of natural persons on the basis of existing theories.

(ii) Qualitative analysis of AI cracking captcha

For AI cracking captcha, it is supposed to investigate the responsibility of natural persons behind it. The

natural person's operation behavior behind AI cracking is actually still a kind of help behavior, but like manual method, the crime of Providing programs for intrusion into computer information systems is still not applicable to independently qualitative the AI cracking captcha. Compared with manual method, AI cracking captcha can be regarded as an algorithmic procedure, but without the assistance of accounts, passwords and other information, AI cracking captcha itself still does not have the function and effect of obtaining computer information system data without authorization or beyond authorization, which is not in conformity with the definition of procedures and tools specifically used for intrusion and illegal control of computer information systems in Article 2 of the Interpretation of Several Issues Concerning the Application of Laws in Handling Criminal Cases against the Safety of Computer Information Systems promulgate by the Supreme People's Court and the Supreme People's Procuratorate. Therefore, in terms of qualitative analysis, the author believes that we can still refer to the idea of charging manual method in Chapter 3 of this paper. In the case of not constituting a joint crime with others, we can use the crime of helping information network criminal activities to pursue responsibility. When there is definite evidence to prove that they have intentional contact with others, we still pursue the responsibility of accomplice.

#### **4.3 The overall response to the behaviour of Cracking the network security verification system**

At present, a series of technical services to break the security verification system have spread rapidly, which has cleared the technical barriers for a large number of network criminal activities and become the key driver of the implementation of other network criminal activities. Therefore, it is necessary to put forward a universal solution to the regulation of this kind of helping behavior based on the analysis of several specific behaviors.

##### **4.3.1 The development trend of the helping behaviour of cracking network security verification system**

There must be loopholes which can be cracked in technical code. From the 'cracking captcha' and 'face recognition' behavior, it can be seen that with the continuous reinforcement of network security verification system, the hackers' means of attacking and cracking are also upgrading, showing a new development trend. On the one hand, artificial intelligence is a hot topic of current technical research and the application field is expanding rapidly. In the future, more black industry workers who crack the network security verification system will operate by taking AI technology as a breakthrough. The speed and accuracy of using AI technology to break the verification system will be greatly improved, and the harm will be greater as well. The mechanism and function of preventing illegal intrusion will also be fundamentally reversed. On the other hand, biometric information is inherent, and its non-renewable nature has brought about the immutability and uniqueness of recognition. With the development of substituted face recognition, fingerprint recognition, sound recognition and other security verification methods, the future cracking behavior will also make more use of biometric information. The biometric information is undoubtedly a kind of personal information that can best represent and depict the characteristics of the subject. Once the verification system is cracked, the abuse of biometric information will cause extremely serious infringement on the information subject.

##### **4.3.2 The qualitative induction of help behavior of cracking network security verification systems**

For all the behavior of cracking the network security verification system, although the technology it relies on is different, mostly there is no intentional contact with other upstream and downstream criminal behavior of the industrial chain, it seems to belong to an independent link that can avoid responsibility, but essentially it is a kind of alienation of crime using help behaviour. Whether the specific aided behaviour reaches the quantitative standard of the crime does not affect the conviction and sentencing of

the aid behavior itself. As long as the offender knows that the aided behaviour may belong to the type stipulated by the criminal law in the objective nature, and still provides the help, it has met the constitutive elements of the crime of helping information network criminal activities, and can be directly evaluated separately by the miscellaneous charges of taking assisting behavior as principal offender. If it still constitutes other crimes at the same time, it shall be charged according to the imagined concurrence. However, in the criminal law evaluation system of helping behavior in china, the accomplice liability is still fundamental, and taking assisting behavior as principal offender is a qualitative idea that should be selected only when the accomplice liability cannot be evaluated. In specific cases, if there is evidence of intentional contact between the offender and the aided people, it should still be charged the same as the aided people in accordance with the traditional theory of joint crime. If the help behavior plays a major and key role in the harmful consequence of the case, it should also be treated as the principal offender. In a sense, crime is also a kind of creative destruction, which often drives the progress of society and law. At present, the harmfulness and independence of the alienated helping behavior in cyber crime are increasing, and it often plays a key role in the black industrial chain. Cracking captcha and the similar behaviour that cracking network security verification systems are typical representatives. Its characterization should be based on whether there is a intentional contact with the act being assisted, applying the traditional accomplice theory or evaluating it separately by the crime of helping information network criminal activities. The current legislation should be both forward-looking and transitional. It is necessary to not only sensitively capture the escalating and transforming crime dynamics, but also better be applied the adapt to the current situation on the basis of existing legislation. It is hoped that this paper can provide some reference for the integrated regulation of this new type of network-assisting crime.

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