Abstract

Purpose: In recent years, the keyword that penetrates our society is the 4th Industrial Revolution. The 4th Industrial Revolution can be expressed in many ways, but the most important keyword is “connection”, and the key phenomenon from the perspective of this connection is the development of AI. The 4th Industrial Revolution and the impact of artificial intelligence are more than we think, and each academic division in society is discussing how to respond to it, and criminal law is no exception.

In particular, fierce debate continues as to whether the criminal law will recognize the criminal subjectivity of AI, and whether punishment for artificial intelligence will be possible. With the development of AI, infringement of legal interests, whether intentional or unintentional, can become a reality. When users and developers intentionally use artificial intelligence for crimes, AI becomes a human tool. The question is how to deal criminally with cases where legal interests are violated by intellectual activities or source code errors of AI, although not intended by users or developers. However, the premise to think about this is that AI technology is not complete. In other words, in the event of unintentional infringement of legal interests by AI, punishing humans based on this can have a contraction effect on development, resulting in a regression of AI technology with clear social utility.

Method: Therefore, this study examines how the criminal law should respond in the event of infringement of legal interests while human factors by AI is excluded. To this end, we first look at the current status of criminal law responding to AI. Here, we will first examine whether a specific operation of AI will be included in an act that is the scope of criminal law, and, if so, whether to recognize criminal identity to AI that caused such a specific operation.

Results: Through this process, the specific operation of AI can be subject to criminal law, and furthermore, if there is an infringement of legal interests by AI, it is confirmed that there is room for a crime. However, it is assumed that the action of AI is only unintentional infringement in which human elements are excluded. AI infringes on legal interests by human factors because it has the same meaning as human tools.

Conclusion: Since the ongoing development of AI technology can hinder the development of artificial intelligence technology with clear social effectiveness, it argued that the criminal law should be supplemented after administrative procedures.

Keywords] Artiﬁcial Intelligence, The Fourth Industrial Revolution, Changes in Criminal Law, Criminal Subjectivity of Artiﬁcial Intelligence, Contraction Effect

1. Intro

Recently, one of the topics that penetrates our society is the Fourth Industrial Revolution. The 4th Industrial Revolution refers to an era in which digital revolution is caused by the combination of artificial intelligence technology, Internet of Things, and big data through the 1st industrial revolution, the 2nd industrial revolution of mass production due to the emergence of
electricity and production assembly lines[1]. Aside from the controversy over the existence of the 4th Industrial Revolution, the current era of aiming for a hyperconnected society where everything is combined and connected beyond the era of information and globalization has no choice but to acknowledge the reality of the 4th Industrial Revolution. In particular, from the perspective of "connection" of various technological innovation means, the reality is that the substance of the Fourth Industrial Revolution is already settling silently next to us without our awareness. From telecommunication services linked to various IoT services, Apple and Google's personal secretary system, self-driving cars, and artificial intelligence, which is our concern.

Then, what beings can we recognize as a blueprint for the future society, even if they are not the latest buzzword of the Fourth Industrial Revolution? There may be many things, but I think it is an artificial intelligence robot. Artificial intelligence, especially artificial intelligence robots, is an essential tool in describing the future society in various media. It is a threat to humanity in some media, and another is depicted as serving human convenience. As such, our consciousness flow of looking at artificial intelligence is formed by a dual flow of pure and dysfunctional functions. While it is so natural that science and technology, including artificial intelligence, contribute to human benefits, warning and worrying about the dysfunction of artificial intelligence is the same phenomenon as Pandora’s box in some ways. At least in our criminal law system, the former case is put a little more weight on it. This is because the controversy over artificial intelligence in criminal law academia is largely being discussed around the change in the function of criminal law caused by artificial intelligence, that is, whether traditional criminal law can be applied to the heterogeneous existence of artificial intelligence.

This study also does not intend to deny the premise that artificial intelligence can harm our humans and society. However, the starting point of this paper is that artificial intelligence technology is essentially a technology that is still developing. Infringement of legal interests by artificial intelligence can occur at any time, which can be caused by negligence as well as intention of the system designer. What is particularly problematic is the unexpected infringement of legal interests by artificial intelligence. The existence of infringement of legal interests by artificial intelligence and the imposition of punishment, which is a public sanction, is a problem for developers and operators, as this can lead to a contraction of artificial intelligence technology due to criminal punishment. In addition, I think the time is approaching to reconsider whether taking criminal punishment for negligence for granted is an attitude consistent with the humility of punishment. Furthermore, if punishment intervenes in artificial intelligence behavior, whether intentional or negligent, it will also be considered whether it is reasonable for criminal proceedings to stand at the forefront.

Therefore, in this study, when artificial intelligence is legally regulated, we will discuss where to put its direction. To this end, we will first review the current status of legislation regulating artificial intelligence. Here, for the premise of discussion, we will look at the concept of artificial intelligence, which is the subject of a simple understanding and discussion of the Fourth Industrial Revolution, and the current status of criminal law corresponding to this artificial intelligence. And based on this discussion, we will look at the current address of the criminal law approach to artificial intelligence. Finally, it is not reasonable in terms of the complementarity of punishment that the criminal law is applied first to artificial intelligence, and procedural law will also consider the priority input of administrative procedures to respond to infringement of legal interests on artificial intelligence.

2. The Background of Research on Artificial Intelligence Regulation Legislation
2.1. 4th industrial revolution - is it virtual or real?
The signal of the 4th Industrial Revolution resonated in Switzerland in 2016 is echoing deeply in Korea until this moment. In the 2017 presidential election, presidential candidates from each political party also argued that they should prepare for the 4th Industrial Revolution, and the 4th Industrial Revolution is still a trend in our society. This also affects university education, and various related majors such as smart factory department, artificial intelligence department, and 3D printing department are installed. In this situation, it can be seen that the Fourth Industrial Revolution already exists at a time when the convergence of advanced digital technology, which can be seen as a symbol of the Fourth Industrial Revolution, is starting to be realized. In particular, this technological optimism is gradually increasing thanks to ICT technology that develops day by day.

On the other hand, the fourth industry "revolution" claimed by technological optimists cannot improve productivity so rapidly as compared to the previous three industrial revolutions, and technical skepticism that convergence (artificial intelligence, IoT), the core of the fourth industrial revolution, is only an auxiliary role for existing industries[2]. Furthermore, the term 4th Industrial Revolution used in 2016 is a term that first appeared in just four years since 2012 when Professor Jeremy Rifkin used the 3rd Industrial Revolution, and both Rifkin and Schwab reconstruct the development process of science and technology into a stage of revolution[3]. In other words, although the constitutional technologies of the Fourth Industrial Revolution have grown rapidly, they recognize that they do not have a ripple effect enough to overturn the existing situation.

In particular, if this technological skepticism is applied to artificial intelligence, the Fourth Industrial Revolution and artificial intelligence can become the story of a further country. This is because it is not possible to assume in the near future that artificial intelligence completely acquires reason and infringes on legal interests in the current science and technology development process. As will be described later, artificial intelligence can be largely divided into 1) cases where infringement of legal interests by artificial intelligence is realized by human intention (programming), 2) cases where infringement of legal interests by artificial intelligence itself transcends human predictability[4]. In this respect, it may be criticized that discussing infringement of legal interests against artificial intelligence is a means to fill scholars' intellectual vanity in the extreme.

However, we need to prepare for a new type of crime that prevents infringement of legal interests through criminal law, even if we don't think of Gilbert Keith Chesterton's words that criminals are creative artists. In other words, the use of artificial intelligence can inevitably lead to infringement and threats to human life, and it is also a reality that appropriate countermeasures are needed[5]. This is because it is possible to assume that artificial intelligence is used for crimes, artificial intelligence is used for crimes, artificial intelligence commits crimes on its own, or multiple casualties are caused by artificial intelligence. Of course, this case can be solved as a civil damage compensation problem, but considering the identity of the criminal law, the number of cases where the criminal law intervenes in artificial intelligence should also be left open. The question is when and how far to intervene and how much to intervene if intervened.

2.2. AI as the core of the 4th industrial revolution

2.2.1. Concept of AI

From the perspective of ripple effect, there will be few controversies as fierce as artificial intelligence. In general, artificial intelligence refers to an intelligent system created by humans, and John McCarthy, the father of artificial intelligence, argued it as “science and engineering that creates intelligent machines, especially intelligent computer programs”[6]. And recently, “mechanical system that artificially implements a human psychological system”[7] and “a sys-
tem suitable for this compared to human intelligence” have been raised on the premise of distinguishing between artificial intelligence and robots [8]. In addition, it is argued that “agent acts autonomously, recognizes one’s environment, maintains long-term behavior, adapts to changes, and makes and pursues the best results” [9], and "AI algorithms are implemented hardware and mechanically to judge and use contextual information” [10].

The reason why such a turbulent definition of the concept of artificial intelligence is being raised is that some consensus is reached on ‘artificial’, but not on ‘intelligence’. Therefore, there is also a position that it is impossible to establish a concept for artificial intelligence in the extreme [11].

Although the controversy over the concept of artificial intelligence itself continues, considering that this study assumes that artificial intelligence violates legal interests from the perspective of social hazards, I would like to understand that artificial intelligence means software that can artificially implement all human mental abilities. However, there is also a position to distinguish between artificial intelligence in terms of software and robots in terms of hardware and to combine them to view artificial intelligence robots as objects of artificial intelligence regulation [12]. This position has an aspect to discuss whether artificial intelligence is recognized as a criminal subject. In other words, in order to independently recognize the subjectivity of crime to artificial intelligence, it is necessary to determine whether to recognize the ability to act and responsibility to artificial intelligence, and to this end, it focuses on the activity of machines that can act similar to human behavior [13]. However, this study is not limited to the view of artificial intelligence because it discusses whether the criminal law will intervene in artificial intelligence regulations, not whether to recognize criminal subjectivity to artificial intelligence robots. Therefore, hereinafter, artificial intelligence (software) will be viewed as a concept distinct from artificial intelligence robots (soft+hardware).

2.2.2. Types and characteristics of AI

A variety of artificial intelligence exists in our reality, ranging from Lee Se-dol’s rival AlphaGo, Apple’s Siri, and IBM’s Watson. Furthermore, artificial intelligence for single play of computer games, which has been around for 30 years, has been developed and commercialized. As such, various artificial intelligence is largely divided into two types according to the intellectual ability of artificial intelligence, so it is weak artificial intelligence and strong artificial intelligence [14]. First of all, weak artificial intelligence (Weak AI) is artificial intelligence at a stage where it has not yet acquired the same mental ability as humans, and this includes most existing artificial intelligence systems [15]. Based on deep learning, it has the characteristic of processing faster and more accurately than humans in a specific area.

Strong AI is an artificial intelligence that thinks and solves problems by itself, not only thinking and judging like humans, but also communicates emotionally with other humans and has autonomy and reflective thinking skills [16]. And if such strong artificial intelligence develops further, artificial intelligence at the stage of transcending humans through self-preservation and self-evolution is called Artificial Super Intelligence.

2.3. Current criminal response to AI

There are two mainstream responses to artificial intelligence in criminal law. The first is a discussion on how the criminal law will respond to the emergence of inhumane beings such as artificial intelligence. In other words, it is a discussion on whether the criminal law will evolve in response to various forms of technological development surrounding artificial intelligence. While the traditional criminal law targets human actions made up of blood and flesh in principle, it contemplates the direction of how to respond to the emergence of heterogeneous beings such as artificial intelligence and the role of criminal law [17].
Second, can artificial intelligence be included as an act under criminal law? And can artificial intelligence be recognized for criminal subjectivity? If it can be admitted, how to proceed with the sanctions is a type.

2.3.1. The need to change the role of criminal law

Paradoxically, as the benefits of artificial intelligence increase, fear of the capabilities of artificial intelligence is felt, and the need to regulate them normatively is being raised. However, controversy has been raised over whether our criminal law will stick to its traditional position as it is now or whether it will come to the forefront to prepare for artificial intelligence and mass risks caused by it. The position calling for active response to the criminal law can transcend traditional types of crimes (from the perspective of the extent of damage), which is a society with risks that exist not only by human actions but also by human actions[18].

Therefore, in order to remove and prevent risk factors that may be caused by human and artificial intelligence factors in advance, it is argued that an active functional change of the criminal law is necessary on the premise that it is necessary to recognize and remove them in advance[19].

However, the side effects of active criminal law response according to risk society theory and risk criminal law have already been sufficiently warned. In other words, pursuing only changes in the function of the criminal law to cope with the phenomenon changes the criminal law to manage risks, not passive legal interests, which can inevitably lead to the expansion of hostile criminal law thinking to exclude risk sources. Through this process, universal legal interests, prepositive punishment, relaxation of personal responsibility attribution, and the emergence of symbolic criminal law will be foreseen. Of course, the cause of protecting legal interests from unexpected artificial intelligence risks will take the lead, but social consensus will be needed as to whether fundamentally improving the constitution of conservative criminal law will satisfy balance.

Whether a change in the function of the criminal law against artificial intelligence is necessary depends on where the current state of infringement of legal interests by artificial intelligence is. If ICT technologies such as artificial intelligence technology and the Internet of Things are in full bloom and the risk of infringement of legal interests that humans cannot predict is clear and exist, there will be room for changes in the function of criminal law. However, I think there is still a question mark as to whether the current state of artificial intelligence development will threaten humans to that extent. In other words, it is reasonable to take a passive approach because forcing the fundamental constitutional improvement of the criminal law to protect humans can lead to paradoxical situations that threaten humans to cope with the threat of artificial intelligence in the development process.

2.3.2. Possibility of criminal intervention in crimes of AI

2.3.2.1. Is the operation of artificial intelligence an act?

It should be discussed first whether artificial intelligence can commit a crime or whether a particular operation of artificial intelligence can be included as a criminal act. Whether or not to view a specific operation of artificial intelligence as an act will vary depending on whether the concept of all constituent behavior can be recognized under the criminal law. If the concept of all constituent behavior is not recognized, the criminal law problem will be limited to (formal) criminal acts, and considering that our constituent requirements do not yet recognize crimes by artificial intelligence, there is a concern that the criminal response itself will be difficult. Therefore, if a specific operation of artificial intelligence is of social importance, it can be viewed as an act of criminal law.
2.3.2.2. Whether AI recognizes criminal subjectivity

If so, discussions should continue as to whether artificial intelligence can be recognized as the subject of crime. In response, there is a position to recognize the criminal subjectivity of artificial intelligence based on discussions on the positive theory of corporate criminal ability[20]. On the other hand, artificial intelligence cannot be judged as the same person as humans, and if it is viewed the same as humans, it ultimately violates human dignity and autonomy, so it belongs to natural persons, such as representatives of artificial intelligence[21].

It is the legal policy (or social consensus) according to the times and historical situations of the society that limits rights and capabilities to natural persons such as fetuses and foreigners and grants legal personality to certain beings in modern legislation that recognizes rights and capabilities. If so, will artificial intelligence not only recognize legal personality but also recognize criminal subjectivity?

To review each type of artificial intelligence, first of all, since weak artificial intelligence is only an expanded tool for humans, it would be sufficient to directly punish the human actor for using artificial intelligence as a tool[22]. The problem is whether this action of artificial intelligence is due to the free will of artificial intelligence. Considering that what distinguishes humans from other beings is to judge and make decisions of their own free will, and that such freedom of will (and the possibility of other actions) is the core of responsibility criticism, I think strong artificial intelligence can judge criminal subjectivity based on whether there is freedom of doctors. Of course, strong artificial intelligence aims to engage in activities similar to human mental action, but the current level of strong artificial intelligence seems to be not yet at the stage of catching up with human mental ability. In other words, it can be seen as similar to human free will because strong artificial intelligence acquires various information and knowledge through learning, recognizes the situation through learning, and makes autonomous judgments according to the situation[23]. The freedom of doctors, the core of responsibility in criminal law, is a criticism of humans’ choice of illegal activities despite their freedom and ability to form opposition motives, which differs in that it is a logical process for solving problems, not their own needs[24]. Therefore, even if legal interests are violated by strong artificial intelligence at this stage before the complete blooming of strong artificial intelligence, it is reasonable to ultimately include it as a human crime that produces and operates it.

3. Criminal Proceedings for Infringement of Legal Interests by Artificial Intelligence are Initiated

In order to prepare for infringement of legal interests by artificial intelligence, our society has already begun to take legal action. It includes the "Intelligent Robot Development and Distribution Promotion Act" and enforcement ordinances and enforcement regulations implemented on April 1, 2020. Separately, the theoretical devices reviewed in the previous chapter are also legal responses to artificial intelligence in a broad sense. If legal countermeasures against artificial intelligence are gradually equipped, criminal and administrative procedures will be distinguished in the long run, and we will discuss whether it is reasonable to presuppose criminal punishment for artificial intelligence technology in development.

3.1. Possibility of shrinking effect of criminal intervention in artificial intelligence

If artificial intelligence is universally implemented and commercialized, it is inevitable to expect infringement of legal interests by artificial intelligence, so there is a need to prepare appropriate legal systems and realize them through administrative or criminal procedures. However, there is room for theory as to whether it is reasonable for criminal procedures with post-mortem and retribution characteristics to intervene, even if artificial intelligence technology is
not complete at this point. In other words, there is a possibility that punishment will inevitably lead to the contraction of artificial intelligence’s R/D personnel in the absence of predictability, rather than when human criminal intent is hidden in source code. Wouldn’t the primary input of criminal punishment for unintended crimes by artificial intelligence be a timely ordinance in the era of the Fourth Industrial Revolution? This means that if the warning about the collection of personal information by big data was accepted without criticism, the negligence of the development of ICT technology definitely exists further in the 4th industrial revolution (presuming that the concept of the 4th industrial revolution is an illusion)[25].

Therefore, if it is not a deliberate crime using artificial intelligence, especially artificial intelligence, it is necessary to be wary of the contraction effect that can be caused by criminal punishment for the development and operation of artificial intelligence. The chilling effect is understood to argue that a situation in which a specific expression actor directly shrinks freedom of expression by the state’s public power has occurred. Of course, the atrophy effect in the original sense is being discussed in terms of freedom of expression. Since the first use of the contraction effect in the field of labor law in 1990, our Constitutional Court has mainly used it to ensure freedom of expression, but has tended to expand to other basic rights (especially academic freedom).

3.2. Order of intervention in case of infringement of legal interests by AI

Of course, even in such a case, the case of intentionally using artificial intelligence to utilize crime or instilling a crime-causing factor in the source code of artificial intelligence will naturally be excluded. This is because artificial intelligence is used as a lifeless tool for humans to utilize crimes. The concern about the contraction effect of artificial intelligence development in this study is that only cases except for these direct cases were assumed. Therefore, for these active types of crimes, it would be reasonable to always wait on the starting line for punishment. This is because the state should refrain from exercising the right to punish members of the community to ensure the freedom and autonomy of community as much as possible, that is, it should actively induce social policy state activities by using minor social control measures that have the same effect in achieving the purpose of criminal law[26][27].

Considering these points, administrative procedures are applied first to unintended infringement of legal interests by artificial intelligence, and if post-correction is not made by administrative procedures, it is reasonable to supplement criminal procedures[28]. However, considering that administrative investigations are not compulsory but need to confirm facts, minimum effectiveness needs to be guaranteed. In the future artificial intelligence regulation law (including the Intelligent Robot Development and Distribution Promotion Act), the obligation to cooperate in administrative investigations and the corrective order of the competent authority (as of Article 41)[29].

3.3. Criminal law’s response to unintentional violation of legal interests by AI

The problem is that even if the criminal law is applied supplementally to unintentional infringement of legal interests by artificial intelligence, the contraction effect of punishment and the risk of punishment are essentially conflicting[30]. In other words, the actual application of punishment in the actual application case of artificial intelligence technology is to suppress infringement of legal interests through the above, so in a way, the punishment and contraction effect in the criminal law are both sides of the coin. Therefore, I think minimizing legal interest infringement (possibility) by artificial intelligence and finding an appropriate balance of the atrophy effect by punishment (or harm) are one of the challenges of our society in preparing for the era of artificial intelligence[31]. In other words, in light of the inevitability of science and technology development, the spread of artificial intelligence is inevitable, so I think it is reasonable to treat infringement of legal interests by artificial intelligence according to the allowed
risk theory.

4. Outro

Even if Moore's law is not borrowed, the development of ICT technology is developing to a level beyond human control[32]. In this phenomenon, there is a lot of controversy over how our criminal law should respond, and the criminal law's countermeasures against infringement of legal interests by artificial intelligence, which can be seen as the core of the 4th industrial revolution, can be seen as a major milestone. This is because the integrated operation of various conventional ICT technologies is a major theme of the Fourth Industrial Revolution, and artificial intelligence is representative[33].

In this situation, there are conflicting positions in both directions as to what attitude the criminal law will take. As many people, including Stephen Hawking and Alan Musk, warn, new ICT technologies have the potential to pose a threat to us, and their potential can be realized by connecting with each other. Therefore, whether intended or not, it can be easily argued that criminal law should actively and preemptively intervene in the development of science and technology, including artificial intelligence. However, the criminal law is essentially passive and cannot lead social phenomena with normology, and if the norm leads the phenomenon, it can violate the nature of the criminal law that prevents infringement of legal interests on the basis of warning[34].

There is always a possibility of unintentional infringement of legal interests by artificial intelligence, but the social benefits of artificial intelligence will also have a value equal to or greater than the risk. Therefore, taking out the blade of punishment only in consideration of infringement by artificial intelligence, or even taking an infinitely benevolent view of artificial intelligence would not be valid. Considering these points, it is time for social consensus on where to place the balance between infringement of legal interests by artificial intelligence, especially unintentional infringement.

In addition, this study suggested that administrative procedures such as administrative investigations should take precedence because active intervention of criminal law can have a contraction effect, but criminal punishment should be intervened only if it does not comply with these corrective orders.

5. References

5.1. Journal articles
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5.2 Books
### 6. Appendix

#### 6.1. Authors contribution

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