Intellectual Property of Satellite Images Analyzed by A.I.

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Abstract

1. The main question of my research is "who will possess the intellectual property rights of remote sensing images, obtained from observation satellites, analyzed through big data analysis conducted by A.I."
   In consideration of this theme, I am aiming to organize the following controversial points which may arise from the sale of satellite data:

   1) Intellectual property rights attributed to raw data;
   2) Copyright of the results of A.I. data analysis; and
   3) Rights (copyright and patent rights) of the firms that create the algorithms.

2. To further examine this issue, I begin by discussing two topics from intellectual property law and international space law perspective:

   1) Points of contention regarding the attribution of copyright for satellite data extracted from observation satellites; and
   2) The idea of "the denial of preferential access right for the remote sensing data of surveyee's countries" which was provided in the 1986 Remote Sensing Principles.

3. In addition to the above, I aim to highlight areas that may be problematic in this new era for the space industry, as well as notable points for business players, by superimposing data analytic methodology with a discussion of the rights of A.I. deliverables. The aim of this paper is to integrate a space law issue (rights of remote sensing images) with an intellectual property law issue (with an emphasis on traditional issues as well as A.I. rights).

4. To conclude, I will highlight certain opinions from a legislative perspective and emphasize the importance of critical importance of strategic contractual coverage of these issues.

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1.   Introduction

Recently, deep concerns have been expressed regarding the business utilizing satellite data. Ministry of Economy, Trade and Industry (METI) of Japan submitted a report on "planning committee as to the opening & freeing and environmental improvement of governmental satellite data" and, consequently, a platform for promoting the use of government satellite data called "Tellus[1]" has established.

In the observation satellite field in the world, as exemplified by U.S. firms such as Skybox imaging (currently Terra Bella, which was acquired by Google), or Planet Labs (currently Planet), small satellite constellations, the idea that the system is comprised from multiple satellites has been attracting attention recently.

On the other hand, there are venture firms that do not even possess and/or operate satellites by themselves but specialize in image processing analysis such as Orbital Insight, who is gaining much attention in Silicon Valley. James Crawford, CEO of Orbital Inside is an expert of developing A.I. (Artificial Intelligence) and innovative software, having worked at Google, the U.S Climate Corporation (Venture of climate data analysis), and NASA (the National Aeronautics and Space Administration). According to Mr. Crawford, the strength of his firm is an image process analytical algorithm through machine learning.

Given the image deployed by satellites and drones, the firm's A.I. provides the tools to distinguish what an object is on the ground and allows someone on the ground to count the number of objects. In short, the technology is able to observe a status change on the ground accurately and swiftly from an angle where it cannot be seen with human eyes.

In other cases, The Climate Corporation launched insurance services and farming support through a management system, The Weather Company acquired by IBM in 2015 delivers highly sophisticated data analytics services to the airline and energy industries.

It is expected that those firms which analyze satellite data through proprietary algorithms and sell (in most cases "license") such data will continue to grow in numbers.

When highly priced satellite data are sold, the question of "who has the right for the asset?" arises. In this paper I address that question in terms of intellectual property rights. The firms most likely to claim the rights will be as follows, in the following order: 1) Firm providing image processing analytical services to its client; 2) Firm providing A.I to transact imaging processing analysis; and 3) Firms owning satellite data sets for learning allowing A.I. to conduct deep learning and so forth.

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1   https://www.tellusxdp.com/

This paper, based on an assumption that satellite data usage will further prosper commercially, will consider the relations of these rights as they pertain to space law and/or intellectual property law, and provide an indication about the trading practices going forward.

2.   View Point of Intellectual Property Law

In the case of producing Big Data, which accumulated valuable analyzed information where the analysis stage of satellite data from Observation Satellites by using AI with an original algorithm, the question arises of to whom does a right of the deliverable belong. The starting point of the discussion is that a legal system of intellectual property does not protect products generated by A.I. because it is premised on creation by a person.[2] As reference of a legislative solution, British law (CDPA) gives certain copyright protections to a computer-generated work, and the author is said to be the person who takes necessary arrangements.[3] In Japan, it is considered that there is a possibility of protection as a copyright, a trade secret or a patent for the right of Big Data, which accumulated deliverables analyzed by AI, but it can be said that it is at the stage of being protected by the Unfair Competition Prevention Act going forward. Thus, while the speed of legislation does not align with actual technical innovation, it is a widely-held belief that satellite data with a very high added value analyzed by AI will be valued at a market.

First, I classified such business into the five aspects in the order of time of a satellite data analysis, and I will consider intellectual property rights in examining the following five aspects.

(1) right to primary data/ processed data/ analyzed information from observation satellite
(2) right of the company which has developed the original algorithm of A.I. program to analyze satellite data
(3) right to satellite data set for learning itself used to have A.I. learn
(4) right to products which have formed by inputting new data and directions to A.I. which has completed the learning process
(5) right to Big Data which accumulated information analyzed by A.I.

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2   In France, there is a decision of a court of appeal of May 14th 2003, regarding an infringement case against a jigsaw-puzzle company, that the court held that the image reproduced on the jigsaw-puzzle was a copyrighted work that could not be reproduced without permission, not much per se but because it was arranged by the company (choice of colors, contrast, etc.) and thus became a work of art.
3   Andres Guadamuz, "Do Androids Dream of Electric Copyright? Comparative analysis of originality in artificial intelligence generated works," Intellectual Property Quarterly, 2017 (2)

2.1 Right to primary data/ processed data/ analyzed information from observation satellite

From the viewpoint of intellectual properties, it is difficult to protect primary data. The Copyright Act of Japan, like other countries' legal copyrights, provides that it is necessary to have "creativity" defined as "a production in which thoughts or sentiments are expressed in a creative way. [4]" Even if primary data is taken by adjusting the angle of the sensor of an earth observation satellite, it is mere digital information which is an object of program processing obtained mechanically (enumeration of "0" and "1"), so there are no elements of "creativity."

On the other hand, it is difficult to judge when it comes to processed data which is digital and imaged information after radiometric processing or geometric processing because "exactly the same" data is not produced by whoever it is processed. However, the range of creativity is rather narrow, and accordingly the scope of copyright becomes very narrow even if it is concluded creativity under the copyright law is recognized (or in some cases, creativity is not recognized).

Moreover, analyzed information after the processing of geometric, atmospheric, and/or ortho correction, as well as map overlay show "creativity" and hence it could be copyrighted.

2.2 Right of a company which has developed original algorithm of A.I. program to analyze satellite data

What rights can a company that producing an A.I. program to analyze satellite data by a programming containing original algorithm assert?

First, even if we assume algorithm (idea) of a program is a logical function of processing and combination of an order to reach some results, and a question arises as to how much that is " original," it is not considered as a creative expression protected by copyright law.

Next, a program is defined as "an expression of a combination of instructions to cause a computer to function in order to be able to obtain a certain result."[5] Accordingly, programs are considered to be protected as works under the Copyright Act because they have the creative nature of "expression" from the combination of algorithms. While the above interpretation was made clear by an amendment to the act in 1986in Japan, programs that had already existed before the amendment are protected as copyrighted works even without domestic legislation due to the concept that a copyright exists the moment a work is "fixed" is accepted globally.

From the view of the Patent Law in Japan, a program is protected as "invention of a thing (program, etc.)" if it satisfies certain elements, such as susceptibility, involvement of an inventive step and novelty, etc. Also,

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4   Copyright Act Article 2, Section 1, Item 1
5   Copyright Act Article 2, Section 1, Item 10-2

process of mechanical learning is protected as "invention of a method" if it satisfies conditions under a Patent Law. Recent discussion suggests there is a room of protection as "invention of production method." It depends on each program, but there can be an enough possibility that a program is protected under a patent right.

From the above discussion, even if it is difficult to protect the algorithm itself, there is a possibility of protection for A.I. programs developed to analyze satellite data under copyrights, patent rights, and depending on conditions specified under domestic legislation, as a trade secret.

However, technical innovation of A.I. program in a practical business affair is quite speedy, and it always keeps evolving, so it can be said that making a claim to prove an infringement of rights is extremely difficult.

2.3.   Right to satellite data set for learning itself used to have A.I. learn

If A.I. is made to go through a deep learning process, one of mechanical learning types, by using a data base for learning which has accumulated a large amount of satellite data from earth observation satellite, it is possible to have such A.I. have a specific function. For instance, if car types are specified (e.g. "This is a passenger vehicle, and that is a medium size truck."), and A.I. is made to read a great amount of data set, such A.I. which has completed the learning can specify passenger vehicles and medium size trucks from new satellite data. As for the right to database for learning, I will examine "intellectual property right of data base itself."

2.3.1   Creativity of data base

A database is defined under Japanese law as "a collection of information, such as dissertations, numerical values or diagrams, which is systematically organized so that such information can be searched by use of a computer."[6] The Japanese Copyright Act was amended in 1986 earlier than other countries, and rules for a copyright of a database were made independently from those for edit work, but it is possible to determine that essentially there are no differences between a copyright of a database and an edit work, so it is possible to say that globally there is a tendency to regard both of them have as an edit work.[7] When creativity is recognized in systematic composition, it is possible to consider that it is protected as a work.

In Japan, "the Intellectual Property Strategy Headquarters" has been established in the prime minister's official residence due to the importance of intellectual property rights. As a result of examining whether databases automatically accumulated fall in the category of works under the current Copyright Act in "the Committee of Intellectual Properties of the Next

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6   Copyright Act Article 2, Section 1, Item 10-3
7   "Counsel Directive of 11 March 1966 on the legal protection of databases" in EC includes non-electronic items such as paper media, which are significantly different in this respect

Generation" of 2015, while "systematic composition" is recognized to have creativity from its structural improvement, the Committee concluded that it may not possible for "systematic composition" to be protected under the Copyright Act (1) when it is difficult to conclude that creativity in "systematic composition" is recognized in case universal structure or form, etc. is adopted and (2) in case "information selection" and "systematic composition" are conducted not by a human being but by computers.

Therefore, it is considered that creativity in a database merely automatically accumulating satellite data is not recognized. Yet, there is a possibility that creativity of a database is recognized if it has been reorganized as a database suitable for leaning, by providing annotations and/or reorganizing the order.

2.3.2 Cases where each data is a copyrighted work

When a database for learning is created, there are cases where a copyrighted work is sometimes included as the original data. As mentioned above, the scope of creativity is narrow in case of satellite data, but the principle is that a copyright of the work which becomes origin is protected as usual.

In explaining this issue, it cannot be helped mentioning Article 47-7 of the Japanese Copyright Act which is quite unique in the world. This article can be understood as entitling others to use a copyrighted work without permission of its author subject to a certain limitation if the purpose is developing A.I. That is to say, Article 47-7[8] admits reproduction for a "data analysis", and when it is for "data analysis," it is considered to be possible to create data set for learning by recording a work and adapting it without consent of the owner of the copyright to the necessary extent. There is also no limitation in the work which can be used, and even a work on paper base or unpublished work can be used. The most important point of this article is that it is not limited to "use for non-commercial purposes." In other words, this article applies to record a copyrighted work onto a recording medium or to make an adaptation of a copyrighted work for creating an A.I. model which has completed leaning for commercial purposes (for sales or provision for profit).

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8   Article 47-7 To the extent that it is considered to be necessary, it is permissible to record a work onto a recording medium or to make an adaptation of a work (including recording a derivative work created by adaptation) if the purpose of doing so is data analysis (meaning the extraction, comparison, classification, or other statistical analysis of language, sound, or image data, or other elements of which a large number of works or a large volume of data is composed; the same applies hereinafter in this Article) by means of a computer; provided, however, that this does not apply with regard to database works compiled for use by persons who carry out data analyses.

Looking to other countries, we can find articles which have the same purpose as that of Article 47-7 of the Japanese Copyright Act.[9] However, it permits "record and adaptation" for non-commercial purposes as well as in case of development by research institutions. Thus, Article 47-7 of the Japanese Copyright Act which applies even for commercial purposes is said to be rare from a global perspective.

The rules are based upon the understanding that the result of the information analysis does not continue as creative expression produced by the original work, and as "ideas" will not be protected by copyright. Therefore, copyright of existing works will not extend its scope to information analysis.

At the same time, according to international treaties on copyrights, there should be no issue for each country to prescribe the restriction of copyright by its own discretion, as far as it does not go against three step testing.[10]

Further, it was an issue of interpretation whether mechanical learning including deep learning was included in "data analysis" in the text of this Article 47-7, but the article will be abolished on January 1, 2019, and it will be clearly included in "information analysis" by the new text of the act coming into effect as the Copyright Act Article 30-4. Also, this amendment permits acts, such as (i) creating and selling data set for learning to many unidentified people or publishing it on the internet, (ii) selling used data set for learning to many unidentified people or publishing it on the internet for free, and (iii) sharing data set for learning within a consortium consisting of specified businesses.

However, a conditional clause is included in the text of this new article stating that "However that the foregoing shall not apply the case where such data is likely to unreasonably prejudice the interest of copyright holder in light of the type and the usage of work as well as the manner data utilization." When it comes to "interest of copyright holder", and when taking the purpose of copyright into consideration, the manner of usage that

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9 A provision on the restriction on text and data analysis established in the UK in 2014 (Article 29A) is based on information analysis which is conditional on being done for the sole purpose of research. The draft European Directive (2016/0280 (COD)) announced on September 14, 2016 also has a provision of the restriction on text and data mining (Article 3), but this also applies to information analysis only carried out by research organizations for scientific research purposes. Furthermore, in Germany, there is also a right restriction provision on information analysis in the revised copyright law bill released on February 1, 2017 (60 d). Again, it is conditional on information analysis to be conducted for academic research and without profit-making.

10 It is thought that the law in the "use place" of the copyrighted work is applied, but in the case of the act of using the copyrighted work through the internet, it is difficult to decide the applicable law depending on the location of the server, the location of the user, etc, However, if there is a server in Japan and a person in Japan conducts data download or learning using the server, it is almost certain that the Japanese Copyright Law 47 - 7 will be applied.

suffices recipients of copyright works can be considered. Widely provided work to utilize for data analysis, such as newspaper company's database should be purchased for certain fee paid to the provider, and the conditional clause should apply when the work is used without permission

In addition, government satellite data may contain unique constraint, such as it is necessary to collect of appropriate consideration which may occur when copyright falls under the National Property.[11]

2.4 Right to products that have formed by inputting new data and order to deep learning AI which has completed learning process

What if A.I. writes a novel? Where does the copyright belong? Such a debate has raged, but there is a view that whatever A.I. produces autonomously does not fall under copyright, since the output is not based on an expression of thoughts and emotions. However, if freely available to use, valuable A.I. output will not be protected and free ride goes rampant.

In discussions happening in Japan, according to Copyright council of Agency for Cultural Affairs, it is said that a copyright may be accepted if there is "an intention of creation" and if, in the course of creation, there is a contribution given by human in order to gain certain output.

Also, in the report it states that "if creativity is recognized in computer-based creation, the author is considered to be the one who contributed to produce the output, and in normal case the author should be applied to those who utilize the computer system." Since programmer of the A.I. should be considered to be an instrument for the act of creation, hence the programmer is assumed not be an author of computer-generated products.

Therefore, since it can be considered that the outputs produced by A.I. are protected as copyright when, in the process of A.I. producing the product, there is an intention of creation given by the users of the machine learning model, and at the same time when there is a contribution of creation for producing A.I. products. This further extends to consideration that A.I. is utilized for generating an output in order to creatively express his/her thoughts and emotions.

On other hand, if users only gave simple instructions such that the significant contribution cannot be recognized (except in the case that the creator of A.I programs and machine learned model becomes the author), the product by A.I. will be assumed to be "A.I. deliverables that are produced autonomously," and there should be a high possibility that copyrighted work will not be realized under the current copyright law.

However, as to what extent the engagement would determine the contribution to realize the copyrighted work, it is yet to difficult to decide the possible direction of the conclusion, as technological change around A.I. has

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11 In case of Japan, Section 2, Paragraph 1 of the National Property Act and Section 9, Paragraph 1 of the Government Finance Act

been greatly changing, and as accumulation of particular examples is still limited.

2.5 Brief Summary: Right to Big Data which accumulated information analyzed by A.I.

This paper has discussed the right of satellite data itself, the right when such data will be transformed into a database for deep learning, and the right when Big Data is absorbed by A.I. Based on the previous consideration, there is not much of an issue to putting massive satellite data into a deep learning database. In addition to it, if those databases are produced by oneself or purchased from third party, allowing the A.I. process to deep learn, and consequently produce deep learning A.I., the program of A.I. itself has the potentiality of protection by Intellectual Property Right. Also, valuable analyzed information being produced by A.I. will belong to the firm which conducted A.I. analysis, if creativity is recognized. In the light of those consideration, I think how unique data set for deep learning can be created is the most important in commercial satellite data business analyzed by A.I.

In terms of distribution channels of satellite data analysis, it is predicated that the firms owning the rights of A.I. and the firms that are users of A.I. are the same firms in many cases now, but if a firm begins to outsource A.I. development and there is no creative contribution to produce A.I. output of the firm, then considerations as to where the rights will belong to may start over from the beginning. In addition to the current examination to protect with trade secrets, it is time to consider the protection according to speed-sensitive technological innovation (protection other than intellectual property framework).

3. View Point of Space Law

3.1 What is new to discuss regarding Space Law

Next, as far as satellite data issue goes, it is essential to discuss the regulations surrounding International Space Law. Even if copyright of satellite image has yet to be clearly established in the "Principles Relating to Remote Sensing of the Earth from Outer Space," there have been a number of discussions as to whether copyright is supplied in satellite images or not. Furthermore, if so, then at which point of time copyright is generated? The perspective which should be added to the past discussion undoubtedly pertains to valuable satellite data tracings conducted among private firms, the data automatically analyzed by AI (with deep learning), far faster than the transactions executed by human beings. In summary, those two points should be taken into consideration: 1) Intervention of analysis by A.I. 2) Increasing of the usage in business practices. I examine the United Nation's Remote Sensing Principles and International Space Law.

3.2 International Law for Remote Sensing Image distribution (with a focus on the United Nation's Remote Sensing Principle)

Currently there is no express provision in Outer Space Treaty or other treaties when considering on the operation of earth observation satellites. In such circumstances "Principles Relating to Remote Sensing of the Earth from Outer Space (UN Principles)" that was adopted at U.N. General Assembly resolution in 1986 is still functioning as an international guideline. In UN principles, the entitlement of prior consent or prior notice of the sensed State has not to be recognized, so liberty of a state carrying out remote sensing of the Earth from space is unrestricted. However, formation as well as protection of intellectual property right and the relation of accessing right of sensed States has not been clearly stated.

Within UN principles, I suppose analyzing Principle XII would be critical for further consideration. Principle XII states as follows:

> As soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed State shall have access to them on a non-discriminatory basis and on reasonable cost terms. The sensed State shall also have access to the available analyzed information concerning the territory under its jurisdiction in the possession of any State participating in remote sensing activities on the same basis and terms, with particular regard being given to the needs and interests of the developing countries.

By comprehending the principle that the primary data and the processed data are associated with copyrights (the area of protection should be minimal however), it can be conceived that a granted consideration should be included within in "reasonable cost", the term to exercise of accessing right from sensed States.[12]

On the other hand, with regard to analyzed information, it is nothing but accessing the data indiscriminately with reasonable cost, is allowed only under the conditions of 1) "the country" which obtained images is possessing and 2) the data is "usable".

As this paper mainly copes with the relations of right from perspective of party who creates remote sensing satellite data, it does not go too far on the conflicts of rights which relate to accessing rights of sensed States. However, in light of Principle 12, if the value added analyzed information is recognized to gain intellectual property right to private individuals/firms, it is reasonable to conclude that access right by the sensed State will not be allowed subject to the principle without the consent of the firm who obtained copy right for analyzed information.

Also, as to the point whether Principle 12 have binding restrictions based on international customary law, given that commercial practices of satellite

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12   Atuyo Ito, "Legal Aspects of Satellite Remote Sensing,"45-66, 213-232, Martinus Nijhoff publishers (2011)

image resolution is steadily but rapidly improving, Principle 12 have yet to reach to international customary law.[13]

3.3 Possibility of resolution by International Space Law

By the above consideration, the existing Intellectual Property issue on "potentiality of rendering Intellectual Property Right to private individual" should also affect the application of UN Remote Sensing Principle. Meanwhile, as detailed above 2 of this paper, the legal solution concerning intellectual property rights of satellite data is not made only by the framework of protection based on intellectual property rights. Thus, as analytical business driven by A.I. has been flourishing recently, the development of a rule pertaining to International Space Law should be pondered before the problems surrounding commercial usage arises.

4. Significance of resolving by the contract

Regardless of how the relationship of rights have been clarified in existing laws, business practices continue to take place. Therefore, it is critically important to avoid the potential issue by reaching an agreement on ownership rights as well as terms and conditions by concluding a contract.[14]

Practitioners are required to propose flexible response in contract negotiations. For example, pertaining to the right of already-learned A.I., if a user-provided data set for learning as well as if A.I. is developed by utilizing the data set, there may be some cases in which users claim to development vendors that the right of already-learned A.I. would belong to the user. On other hand the vendor would want to hold the rights to further develop already-learned models. In such cases, contracting should be the most flexible way to resolve. For instance, we can offer to vest the rights of the A.I. to vendor by adding conditional clause of prohibiting the competitively usages throughout a certain period of time.

As just descried as seen above, if and when the person does not adhere on ownership of rights, he/she may be able to aim for a reasonable solution by turning his/her eyes on "terms and conditions". Pertaining to the points of "terms and conditions" when negotiating, we suggest not to omit following views;

- Purpose of usage(should purpose be only limited to development prescribed in the contract)
- Period of usage

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13 Francis Lyall and Paul B. Laresen, "Space Law A Treatise 2nd edition," 359-386, (2018)

14 In Japan, Ministry of Economy, Trade and Industry formulated and announced, "Contract guidelines on the use of A.I. and data" in August 2018.

- Aspects of usage(should reproduction(duplication?), modification, and/or reverse engineering be grated?)
- Licensing/propriety and selected range of transferring to third party (should provision to other firms be granted? Should provision to competitors be prohibited?)
- Profit sharing/Licensing fee

With flexibility of combining "ownership of rights" and "terms and conditions", and not be too adamant about "contract pattern," various ways of practical solutions can be considered, hence unnecessary setback of negotiation can be prevented.

Taking the speed of A. I's technological development into account, while further exploring the legislative settlement, we can proceed the business without having futile legal disputes by combining the clarification of relationship of rights and terms and conditions in the contract.

5. Conclusion

As a conclusion, although we have witnessed the moves of legislative actions and consideration, the relationship of rights in terms of valuable information derived from A.I. analysis has yet to be settled. For practitioners whose own responsibility for their clients is to penetrate their business smoothly, we need to be keen on landing a satisfactory agreement for both parties by bringing flexible ideas into the contract.

It can be said that the environment surrounding the International Space Law is largely and quickly moving, as the space industry has remarkably developed as a private business. That is, in terms of remote sensing satellite data, it is no more only Intellectual Property Law, but it also includes aerospace industry and International Space Law. Through exchanging thoughts and insights with each nation's researchers and practitioners, we need to further expand consideration on satellite data usage issue. It is said that 2/3 of all data stored by AWS, an ace on Cloud services, is remote sensing satellite data. As there is high expectation that analytics of satellite data will even more to flourish, I wish that the discussion of this matter will further progress, hence the legal dispute on relationship of rights will be minimalized.