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A Study on the Construction Method of HS Item Classification Decision System Based on Artificial Intelligence

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Abstract

Industrial Revolution means the improvement of productivity through technological innovation and has been a driving force of the whole change of economic system and social structure as the characteristic of technology as the tool of this productivity has changed. Since the first industrial revolution of the 18th century, productivity efficiency has been advanced through three industrial revolutions so far, and this fourth industrial revolution is expected to bring about another revolution of production. In this study, the demand for the introduction of artificial intelligence(AI) technology has been increasing in various business fields due to the rapid development of ICT technology, and the classification of HS(harmonized commodity description and coding system) items has been decided using artificial intelligence technology, which is the core of the fourth industrial revolution. And it is enough to construct HS classification system based on AI technology using inference and deep learning. Performing the HS item classification is not an easy task. Implementation of item classification system using artificial intelligence technology to analyze information of HS item classification which is performed manually by the current person more accurately and without any mistake, And the customs administrations, customs offices, and customs agencies, it is expected to be highly utilized in the innovation of trade practice and the customs administration innovation FTA origin agent.

Keywords: Information communication technology, Artificial Intelligence, Machine learning, Deep learning, Harmonized commodity description and coding System, Trade, Free Trade Agreement

1. INTRODUCTION

In this study, as the rapid development of IT technology is increasing the demand for the introduction of artificial intelligence technology in various business fields. HS item classification is determined by using artificial intelligence (AI) technology, which is the core of the fourth industrial revolution. [1] This is a study on the establishment of expert system in the field of trade tariff. Recently, free trade agreements (FTA) have been signed with more than 50 countries, and regulations on exports and imports of products are becoming more stringent than before. In particular, the HS Classification Table, established by the HS Convention, is a legally binding regulation item that sets tariffs on exports and imports and further determines their origin, and more and more precise HS classifications on the basis of tariff benefits under the Free Trade Agreement. is required. Currently, most of HS item classification of exports and imports of domestic and medium-sized enterprises is carried out by customs or trade specialists but it is difficult for SMEs and small businesses to receive professional support in terms of cost or region. Accurate HS classification requires the ability of

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specialists to understand, memorize, and locate vast quantities of classification tables. Professional customs officers must also remember the vast amount of legal texts and be aware of the changes in detail in order to make accurate HS classification.

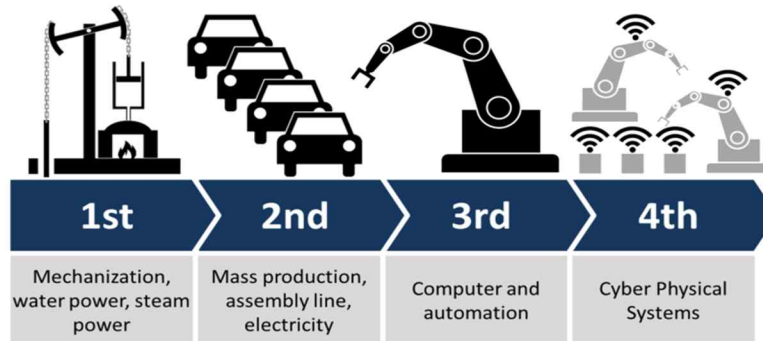


Figure 1. Historical flow of the industrial revolution

AI is at the core of the Fourth Industrial Revolution. The technology classification of artificial intelligence is composed of "learning and reasoning" technology, which is a database of knowledge, and "understandable skills" to understand emotions and spaces, and "language understanding" to understand human language, speech processing, and translation. Technology 'and' visual understanding technology 'that can search images based on contents and recognize human behavior. [3] AI is at the core of the Fourth Industrial Revolution. The technology classification of artificial intelligence consists of the learning and reasoning" technology that makes database of knowledge, the "sense of understanding technology" that can understand emotions and spaces, and the "language understanding" that can understand human language, speech processing, and translation. Technology and visual understanding technology 'that can search for images based on content and recognize human behavior. In addition, there are semiconductor technologies for artificial intelligence. In the previous table, the data are huge and excluded. In other words, Strong AI refers to computer-based artificial intelligence that can actually think and solve a problem. [2] AI refers to computer-based artificial that cannot actually think or solve a problem. In recent years, artificial intelligence can also be defined as the development of technology that gives machines the ability to surpass humans. From this point of view, the IBM's Deep Blue won the 1997 chess game, and the possibility of artificial intelligence regained its attention, which led to the success of the 2005 autonomous vehicle test drive. Watson wins the human champion at the Jeopardy quiz show, bringing about the full potential of AI over humans. In other words, the development of artificial intelligence technology is the growth engine of companies that are rapidly growing globally armed with destructive technology and approaching customers. In addition, the 4th Industrial Revolution, which was the core agenda of the World Economic Forum, is a cyber-physical system in which people, objects, and spaces are connected to the Internet, and cyber and physical systems are linked based on big data produced there. It is a revolution of hyper connectivity and super intelligence that is reorganized into System.

2. TECHNOLOGY OF ARTIFICIAL INTELLIGENCE

2.1 Machine learning technology

Machine learning is a methodology for learning computers using data. Machine learning algorithms can be divided into three categories. [4]

First, supervised learning

Second, unsupervised learning

Third, reinforcement learning

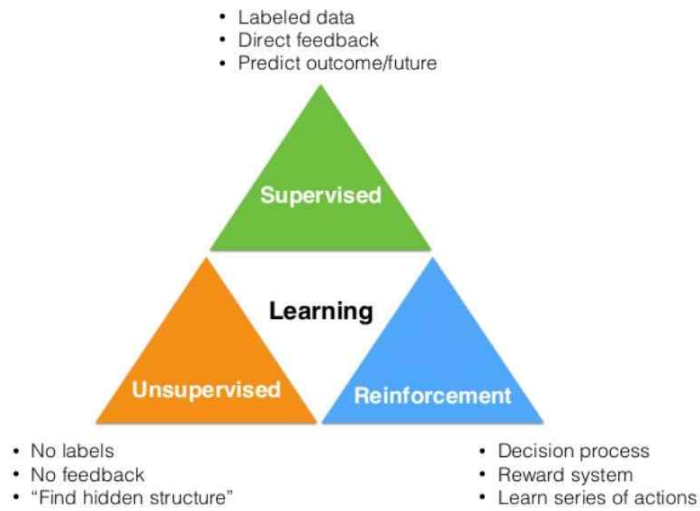


Figure 2. Classification of machine learning algorithm

Supervised learning is a way of learning a computer given a label-correct answer to the data. Unsupervised learning is a method of learning a computer without giving the label explicit answers to the data. That is, it is a method of learning in the form of data. For example, when the data are randomly distributed as follows, it is a clustering algorithm that classifies the data into three categories with similar characteristics.

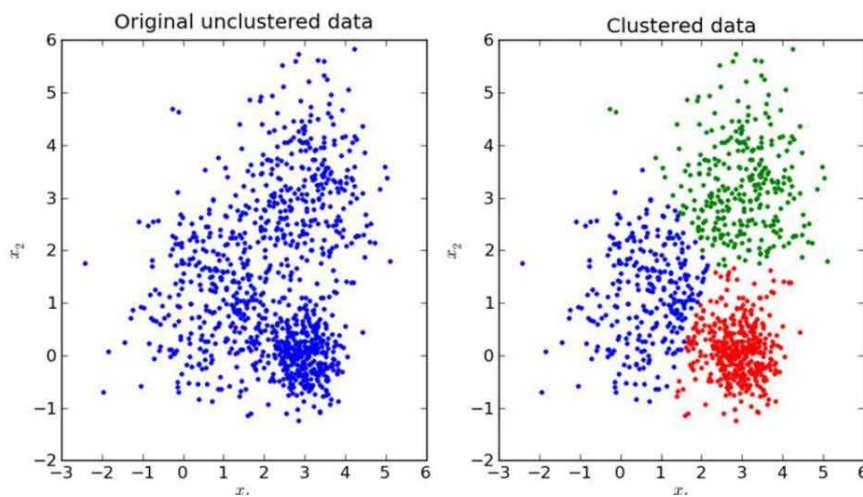


Figure 3. Clustering Algorithm

Reinforcement learning is a slightly different kind of learning algorithm from the supervised learning and the unsupervised learning. If the algorithms discussed above are trained in a static state with data, reinforcement learning proceeds with the agent taking some action on the given environment and getting some reward from it. At this time, the agent learns to maximize the reward. Reinforcement learning is an algorithm that includes the process of collecting data in a dynamic state.

2.2 Deep learning

1) learning and reasoning

Deep learning is a technology in which computers generate their own features based on data. Instead of humans designing features, computers can extract features of higher dimensions and classify images based on them. Deep learning allows artificial intelligence to penetrate deeply into areas that humans have had to consider so far. [9]

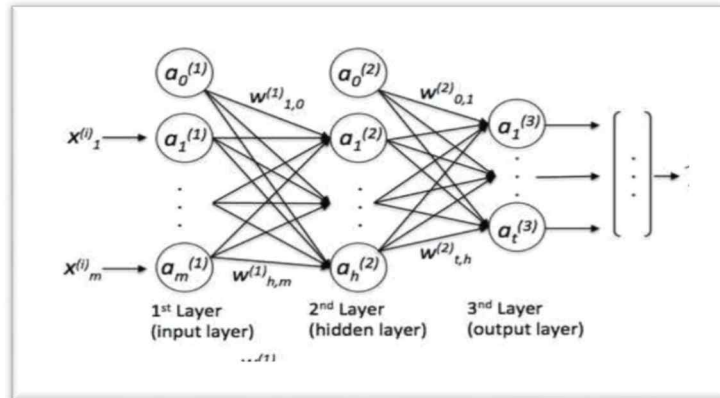


Figure 4. Deep Learning Algorithm

Representative deep learning methods include more than 10 layers of 'convolutional neural network (CNN), convolutional neural network, convolutional neural network, composite product neural network, composite product artificial neural network.

That is, after learning a picture of a dog, a cat, a boat, and a bird, when a picture is input, the machine first extracts several small parts of the picture and synthesizes it to finally conclude that this picture is a boat. Convolution gives weight to the important features of the parts, and the process of pooling the information obtained from the parts is repeated several dozen times and gradually connected to the shape of the object shown in the whole picture, the final prediction step by comparing the shape of the object in the picture with the four previously learned objects, dogs, cats, boats, and birds, they give high probability to the closest 'boat'. Deep learning is a technology that can fundamentally overcome the limitations of artificial intelligence. It can be a breakthrough to solve the outstanding problem of the past 50 years. However, in the future, it is expected that the same algorithm can be applied not only to images but also to other sense-related fields such as hearing and touch.

2) Understand the situation

Cognitive Computing for Understand Situation is a technology that dramatically increases the productivity of a company by processing massive amounts of complex data. It supports human professionals by understanding the complexity of big data while exchanging human languages. It is the next generation information processing system that drives decision making. [18]

Cognitive Computing is an information processing technology that simulates a person's cognitive ability in more academic terms. Cognitive Computing is an open system that interacts with the environment and has the characteristics of perceiving the environment and reacting to the environment. Cognitive computing technology that meets these requirements requires new features such as dynamic processing, various sensor integration, and ability to generate sequential behavior. Unlike traditional information systems, cognitive systems differ in that they perceive the environment with sensors, act on the environment, and interact with the environment. Thus, unlike conventional computing, which focuses on independent information processing separated from the environment, cognitive computing deals with computing as a living and dynamic system integrated with the environment.

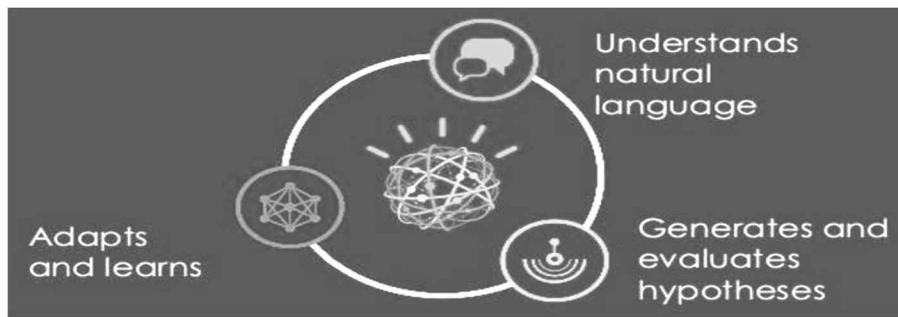


Figure 5. Understanding Cognitive Computing Technology

Cognitive Robotics, which is developed based on cognitive computing, is a representative platform, and includes cognitive robotics such as personal robots, cognitive technology systems, autonomous vehicles, and humanoid robots. Cognitive robotics is a technology that enables intelligent behavior by providing robots with information-processing structures that learn and infer that they can respond to complex goals in a complex world. [9]

Cognitive Robotics, unlike traditional AI technology, uses animal recognition as a starting point for robot information processing technology, so the target robot cognitive ability is a cooperative between complex motors with perceptual processing, attention assignment, prediction, and planning. , Reasoning about agents and their own psychological state, and more. Cognitive robots learn to act in the physical world (or virtual worlds in simulated cognitive robots), and ultimately, the robot must be able to act as an intelligent agent in the real world.

3) Language understanding

Speech Recognition is a software are technology that converts and decodes human speech into speech forms that can be understood by a computer. It is the area from which a machine receives a human voice, understands it and carries out a given command. According to the global voice recognition market research report, biometrics is the driving force for the voice recognition market, and growth is particularly noticeable in the healthcare field. Speech recognition is used in combination with biometric technology to determine whether to accept a specific person's command. The technology also plays a key role in the progress of financial transactions in mobile banking. In other words, Natural Language Processing (NLP), which decodes human language, is a field related to human-computer interaction. . [12] NLP solutions are technologies that enable human-computer conversation by translating meanings when they speak or write in natural language used by humans into languages that the machine analyzes and understands. The growth of the big data industry is driven by solutions for processing critical data more quickly and in real time.

4. RESEARCH METHODS

4.1 HS Identification

The user interface is an element module for inputting item information for HS item determination. When the classification for HS items is insufficient, what information is required is provided in an interactive description system. Researches user convenience for non-experts. The HS classification decision, which is performed only by a professional, is an easy approach to computer system implemented by artificial intelligence technology with only information about the product, not the expert but the business person of the manufacturer who makes the actual product. Through this, the HS classification is more accurate and faster.

The HS Inference Engine studies the deduction and search of HS items by applying the HS classification rules contained in the knowledge source with limited information input. [25] Since some items need to be classified according to their use or characteristics, the HS Learning Engine may apply the reverse rules for each part, category, and head of each source in the HS Learning Engine. HS classifiers are performed by ensuring the accuracy of the algorithm, and the existing classification cases are continuously studied to study classifications in consideration of various cases. The HS reasoning engine contains hybrid chaining that uses both backward and forward reasoning techniques. The content contained in the Knowledge Source is a study that provides correct application by regulating HS general rules, section notes, chapter notes, and heading notes and codes. The HS Knowledge Base contains definitions and interpretations of terms for items, examples of accurate and accurate HS classification, examples of analysis of HS contention, and findings on HS classification.

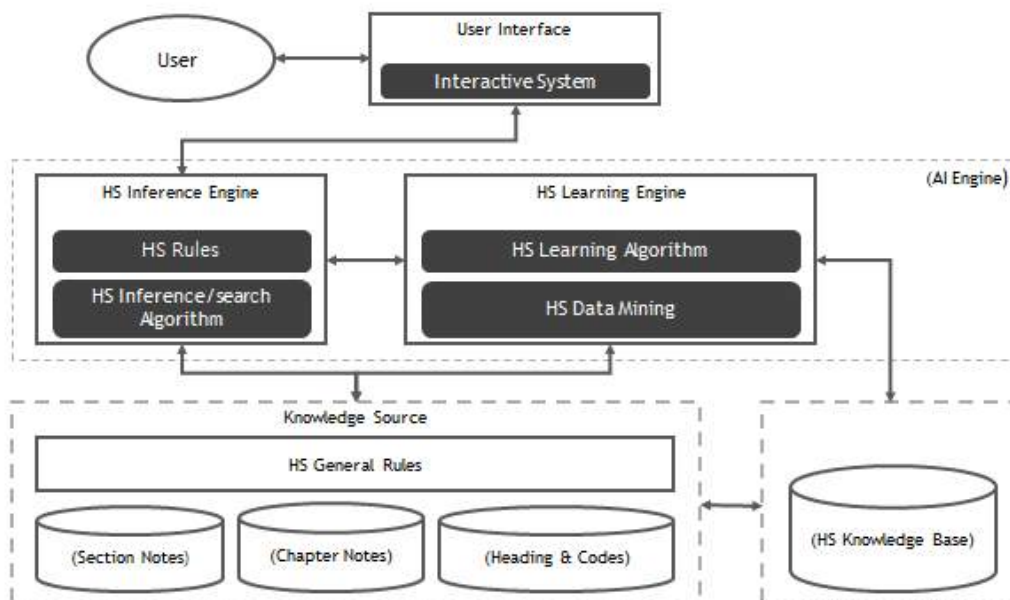


Figure 6. AI based HS classification system

4.2 Functional modules of the HS base

The artificial intelligence machine learning based HS item classification determination system of this study consists of a user interface for entering item information. HS inference engine for applying the entered information to HS rules, prediction, analysis and it is divided into five functional unit modules of the HS learning engine to judge, a knowledge source containing notes and arc terms for HS rules, classes, and classes, and the HS knowledge base storing the final classified results, classification examples, and contents learned. The user interface is an element module for inputting item information for HS item determination. When the classification for HS items is insufficient, what information is required is provided in an interactive description system. To support user convenience for non-experts. The HS Inference Engine determines the HS classification by performing the reasoning and searching accurately by applying the HS classification rules contained in the knowledge source with the limited information inputted. The reasoning technique applied at this stage uses backward chaining. Since some items need to be classified according to their use or characteristics, in case of HS contention, the HS Learning Engine applies the rules for each part, each class and each state of the knowledge source in reverse. HS classifiers are performed with the accuracy of accuracy, and the existing classification cases are continuously learned to classify them in consideration of various cases.

The reasoning technique applied at this stage uses forward chaining. Therefore, the HS reasoning engine contains hybrid chaining that uses both backward and forward reasoning techniques.

5. CONCLUSIONS

This study are the artificial intelligence machine learning based HS item classification determination system, user interface for inputting item information, HS inference engine for applying input information to HS rules, Five functional units of the HS learning engine that predicts, analyzes, and judges cases, knowledge sources that contain notes and arc terms for HS rules, classes, and classes, and the HS knowledge base that stores the final classified results, classification examples, and learned content. The module study analysis gives the HS number. Studied how to build an expert system in the field of trade customs to determine the classification of HS item using artificial intelligence(AI) technology, which is the core of the Fourth Industrial Revolution. It is enough to establish an item classification system, If item classification is made through artificial intelligence(AI), the impact on the customs and trade industry is expected to be very large. For HS classification decisions that are performed only by professionals, non professionals, such as those in the business of a manufacturers who make real goods, use an easy approach to computer systems embodied in AI technology with only information about the goods. More accurate and faster HS classification the realization of item classification system using artificial intelligence technology by analyzing the huge amount of information of HS item classification provides the convenience of FTA origin management and customs administration of domestic and global trading companies. It is expected to be a revolutionary change in customs administration as it is used by managers. The implication of this paper is that it is expected that the trade business process can be easily processed by using artificial intelligence technology in the trade field, and the limitation of the research is that the artificial intelligence technology applied to the real HS classification is insufficient. More advanced research is needed in the future.

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