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Research Article**Analysis of Artificial Intelligence Technologies Used In The Covid-19 Outbreak Process****Fatih İLKBAHAR^a** , **Eylül Sude SÜNGÜ^{a,*}** ^a Faculty of Bussines, Düzce 81620, Turkey

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ABSTRACT

In the course of the outbreak of coronavirus (Covid-19), which emerged in Wuhan, China at the end of 2019, and then spread all over the world, the biggest assistants in the fight against this virus were the technologies which used. Today, the areas where artificial intelligence is applied and the developments in the focus of artificial intelligence lead the technology. With Industry 4.0, there is no need for manpower to meet especially unqualified workforce in many business sectors. The idea of doing things by machines has begun to cause serious changes in the world. In order for the work to be done by the machines, importance has been given to the development of the decision making capabilities of the machines. The decision-making ability of the machines is based on previous periods. The lack of necessary computer hardware parts in testing the hypotheses made in the previous periods caused. It has not been applied in the past due to the high time and cost of hypotheses developed. Today, as a result of the rapid growth of technology, hardware elements with high processing capability can now be obtained at affordable prices. As a result of the acceleration of the developed hardware elements, many methods that took a long time in the past have reached the level that everyone can apply. We observe that what needs to be done for digital transformation in our country has been tested in many sectors. The most basic element for digital transformation is artificial intelligence technology. This is an indication that artificial intelligence technologies have started to be used in many areas of our lives. Accordingly, the use of artificial intelligence technologies in different areas, especially in medicine, played an important role in combating the epidemic during the coronavirus (Covid-19) epidemic process. In this study, the concept of artificial intelligence and the usage areas of artificial intelligence techniques are discussed in the literature section. Then, the applications developed using artificial intelligence technologies during the coronavirus (Covid-19) epidemic process were evaluated and the adequacy of the applications developed by analysing in the method section was discussed.

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1. Introduction

Technology, which is constantly increasing and developing rapidly, causes radical changes in our lives and brings about developments that will affect our lives easier. As a result of technological progress, the idea of realizing machines that behave like humans has introduced the concept of artificial intelligence, which was first put forward by Alan Turing and based on creating intelligent computers. Although there were different scientific studies conducted in the previous periods, one of the reasons for not being accepted is that it was not appropriate in terms of idea and application method. Products produced using

artificial intelligence techniques are becoming an industry. As a result of facilitating our lives of products developed using Artificial Intelligence techniques, interest and demand for products that will be developed using artificial intelligence technologies in many different areas are increasing. The main reason why the demands of the manufacturers and people increased is that artificial intelligence technologies allow to get results quickly and easily without the need for human power. For this reason, in our study, the ability of the technologies needed in the coronavirus (Covid-19) epidemic process, which affects the whole world in many different areas such as health,

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economy and education, to be a solution using artificial intelligence techniques, has been analyzed. The results obtained by analyzing the products or services that are output as a result of the development of artificial intelligence have been evaluated in terms of the effects of the digital concept on our lives. The other contribution of our study is the identification, monitoring and control of the virus during the coronavirus (Covid-19) epidemic process, identifying the virus, detecting infected individuals, continuing healthcare operations, delivery of medical products, sterilization processes, drug and vaccine development. It is the inclusion of artificial intelligence techniques used for products or services developed for information services during the epidemic period. The artificial intelligence techniques developed and the dates of the data obtained covered the period between January and 15 May 2020. Studies in many European countries where the number of cases are most common and in the Chinese state where the virus originated have been examined further. In this direction, the effectiveness of technologies developed with artificial intelligence techniques, which are provided by artificial intelligence technologies in order to control and manage the relevant process and monitor the relevant process in a way that requires less manpower, has been discussed. The study consists of 5 parts. In the first chapter, general information about the purpose, content and process management of the study is given. In the second part, the general definition of the concept of artificial intelligence and some artificial intelligence techniques in the literature are presented. In the third chapter, the data sets obtained during the treatment process of the covid-19 virus, the methods used, the products and services produced are examined. In the last section, some suggestions are made for the benefits of the studies, the necessary needs for future studies and the determination of the problems.

2. LITERATURE

During the covid-19 epidemic period, it was observed that artificial intelligence technologies contributed to people by applying. Basic information and studies required for practical studies were discussed in this section. Basic information is briefly summarized and it is aimed to be a source of ideas for researchers who will do different studies in the future.

2.1. Artificial Intelligence

Artificial intelligence is the science that works to ensure that the functions performed by human intelligence are performed by computers. Artificial intelligence contains software or hardware systems that predict computers to think like humans. Systems developed with artificial intelligence technologies provide development by using the information they obtain. Accordingly, artificial

intelligence technologies reduce the need for manpower and enable the required tasks to be performed in a shorter time, faster and with higher accuracy. Therefore, the main point in the development of artificial intelligence technologies for situations where human labor is required is emphasized as follows; how people perceive certain situations and how they react to them. As a result, computers will be able to perceive existing problems and produce solutions to these problems. With the possibilities offered by artificial intelligence technologies, a lot of data is evaluated, a result is output and at the same time automation of the work to be done is provided. Today, products or services developed using artificial intelligence techniques in many different fields have been widely used due to the possibilities offered by artificial intelligence technologies.

2.2. Artificial Intelligence Techniques

With the existence of Artificial Intelligence in our lives, it started to develop products or services in many areas with Artificial Intelligence techniques. Products or services developed using Artificial Intelligence techniques have been more effective due to low cost, fast processing, proposing solutions to complex problems, low sampling and working in efficient places.

2.3. Simulated Annealing

“Annealing simulation approach, defined by Kirkpatrick, Gelatt and Veechi as an iterative optimization method in 1983, is an iterative random search technique and used to solve different combinatorial optimization problems [1].” Annealing simulation, which is one of the Artificial Intelligence techniques used, is a widely used algorithm for solving problems that aim to produce the best solution in the shortest time and costly to solve with mathematical models. Annealing simulation algorithm is an algorithm based on slow cooling of solids from heating to crystallization, and in the present problem, the scanning of the solution area is carried out in accordance with this approach. The advantage of annealing simulation algorithm compared to other artificial intelligence techniques; it involves less complex and easy-to-implement methods. New solutions for the problems that arise while developing the product or service are accepted or rejected in accordance with the parameters determined in the annealing simulation algorithms. Accordingly, one reason why annealing simulation algorithms are preferred; it is the opportunity to solve problems that are costly to solve with mathematical models. Annealing simulation algorithms are used especially in the field of image processing for products or services developed using artificial intelligence technologies.

2.4. Expert Systems

“Expert systems developed in the 1970s by researchers

working in the field of Artificial Intelligence and commercialized in the 1980s; are computer programs that analyse information about a particular problem, produce solutions in line with problems and propose a sequence of work to make related arrangements [2].” Expert systems are software that have the ability to improve itself over time in line with the information provided by recording the data obtained from experts in their field. Based on the imitation of human behaviour, which aims to develop artificial intelligence technologies to meet the human workforce, expert systems mostly use information display and information engineering methods to imitate relevant experts. One of the main reasons for using expert systems is to overcome the shortage of experts and reduce the related costs.

2.5. Computer Vision

“Computer vision technique that defines the perception process of the human eye; It is used in many different areas to enable the computer to perform the vision process that exists in the human eye, and it is an artificial intelligence field that requires processed images to be interpreted and produced by computers. When computer vision technique is evaluated as a process, it is aimed to realize the detection and differentiation of objects in this process. While using computer vision technique, image acquisition, image processing, feature extraction, preparation, recognition, interpretation and understanding are applied. The definition of the image is carried out at three different levels. Preparation for the second level is made by extracting the information about the image from the data obtained by using low level image processing techniques. At the middle level; Characteristic features that make it easy to distinguish from images are extracted and outputs are saved in data structures. At the third level; Based on the properties obtained, objects in the image are identified and computers decide accordingly.

2.6. Speech Recognition

“Speech recognition is a system that has been working on it since the late 1950s, advancing with increasing speed and trying to take its place in the field of voice recognition. Speech recognition is the process of identifying human voice by perceiving by computers [4].” In speech recognition systems, the identification process is carried out in accordance with the data obtained by perceiving human voice by microphones. In line with the Speech Recognition Theory, there are automatic speech recognition, continuous voice recognition, word capture and discrete voice recognition applications in voice technologies. There are three modules in the Speech Recognition model: speech signal, preliminary training and word sequences. In the signal processing module, the data perceived by computers are converted into exemplary signals and digitized and transformed into a format that

will create an infrastructure for recognition by applying filtering and labelling processes.

2.7. Artificial Neural Networks

Considering the research in the field of Artificial Intelligence, one of the most emphasized points is Artificial Neural Networks. “Artificial neural network technique is a technology developed as a result of exemplifying the behaviours performed as a result of using the human brain. The reason why Artificial Neural Networks are used effectively in many different areas today; artificial neural networks have nonlinear learning, generalization, adaptability, fault tolerance [5].” The operation of a biological nervous system lies behind the technique of Artificial Neural Networks. Accordingly, models are developed to be used in the development of artificial intelligence technologies by creating mathematical models according to the logic of the biological nervous system. The developed mathematical models are used for the purpose of training, learning and decision making of computers. There are three components at the basis of Artificial Neural Networks technique. These are the architectural structure, learning algorithm and activation function. The architectural structure consists of three layers: input, hidden and output. In the feed forward neural network model, the information obtained from the input layer is sent to the hidden layer by providing a one way information flow. The output value is obtained by processing the information in the output layer with confidential. In the feedback artificial neural networks model, information flow is provided in both directions, back and forth, and therefore they are widely used in prediction applications. One of the biggest advantages of Artificial Neural Networks is that it allows it to be learned from the source of information, and the information learned is kept at the weight of the connections existing in the artificial neural network. Learning algorithms are used to train the network in order to reach the weights in order to analyse the information and it is changed according to the criteria specified in the weight and the best value of the weights is determined by the learning process. The activation function is the component used to determine a nonlinear structure in the network and used to provide a curved match between the input and output layers in the architectural structure. The point to be emphasized here is the correct determination of the activation function because it directly affects the performance of the network.

2.8. Fuzzy Logic

“Today, interest in fuzzy logic and fuzzy logic based applications has increased and more research has been started on this subject. It is seen as the first step in the direction of developing computer systems that can think of fuzzy logic technique. Fuzzy logic and fuzzy set theory using fuzzy logic and fuzzy logic rules proposed by Lotfi A. Zadeh in 1965 played a role in the analysis of uncertain systems. The basic element of the concept of fuzzy logic and fuzzy systems is the fuzzy cluster. Unlike traditional systems, fuzzy logic is applied to input the desired output without the need for a mathematical system model, and computers make human-like decisions using fuzzy logic and fuzzy cluster operations [6].” With the fuzzy logic approach, it is aimed to transfer people's experiences and human data in a way that provides an infrastructure to be used in the development of artificial intelligence technologies. With fuzzy logic technique, it is ensured that the data, which can be expressed mathematically, can be processed by transferring it to the computer environment and it is aimed to give the machines the ability to process the data. Considering the development of Artificial Intelligence technologies to introduce systems that think like people, an important point to be considered is that the human thinking system is focused on processing verbal information. Since fuzzy logic technique allows to use linguistic values to be able to process words, results close to human logic are obtained. The biggest advantage of this situation is that; Accessing numerical data to solve problems is difficult and costly, but if sufficient information cannot be obtained, the fuzzy logic technique can produce appropriate results using human thinking and decision-making power.

2.9. Support Vector Machine

“Backing Vector Machine is an algorithm based on statistical learning theory, which was founded by V.Vapnik in the 1960s, and was proposed for classification in 1995, and is now widely used in theory research with the regression density prediction technique. Support Vector Machines are training algorithms used to produce learning, classification, clustering, density estimation and regression rules from the data in order to find the optimum separator plane to separate the two class points by classifying the data points well [7].” Statistical learning theory and structural risk minimization are at the core of the support vector machines. Support vector machines classify similar data by grouping the data to simplify the data obtained or to draw conclusions about the data. Support vector machines are used in classification problems related to datasets where the connections between variables are unknown. The support vector machines technique offers advantages such as high accuracy, modelling of complex decision boundaries, working with a large number of independent variables, and

being able to be applied on linearly separated or non-separable data. Support vector machines are widely used in the identification of objects and time series prediction sets.

2.10. Genetic Algorithms

“Genetic algorithms are an optimization method based on natural selection principles, applied in areas such as function optimization, scheduling, mechanical learning, design, and cellular education. Genetic algorithms are artificial intelligence techniques that work according to probability rules by using the coded forms of parameter sets, only need the purpose function, scan a certain part of the solution space and produce solutions in a shorter time by searching effectively [8].” Genetic algorithms are based on genetic science features and are used to solve complex problems. Genetic algorithms are used to solve problems that cannot be modelled mathematically or whose solution area is very wide. Accordingly, operations that can be carried out in a long time with classical methods are carried out in a short time with sufficient accuracy rate.

Genetic algorithms are widely used in optimization processes, and the main reason for this is to perform an operation with the least efficiency at the least cost.

2.11. Robotic

“In line with the idea of producing machines that think and act like human beings, intelligent robots have an important place in artificial intelligence studies. Within the scope of robot science, applications are carried out in order to create systems that generate information and provide feedback by perceiving the movements around them [9].” Artificial intelligence aims to realize the functions of human intelligence by computer systems. For this reason, smart robots have begun to take place in many areas of our lives. By using artificial intelligence technologies, robots have started to be developed that can fulfil pre-programmed tasks.

2.12. Machine Learning

“Machine learning is the general name given to computer algorithms that are established with the aim of getting the best results, created with the existing data set and the algorithm used and modelling a problem according to the data belonging to that problem [10].” Achieving the right data and using the right tools play an effective role in realizing an efficient machine learning process. Machine learning is used in the solution of a problem for performing independent and democratic processes based on human experience. Machine learning provides the ability to make decisions based on the data obtained by perceiving complex situations in solving problems. There are two different approaches to creating machine learning systems. The first is to eliminate the need for the human brain using machine learning systems. Another approach is to ensure that people and machines work collaboratively.

3. DATA USAGE IN CORONAVIRUS PROCESS

The existing technological infrastructure offers the opportunity to work with a lot of data; data flow is fast and conversion time is short. Accordingly, during the pandemic, datasets were created in many different areas to develop products or services developed with artificial intelligence technologies. Making the created data sets largely accessible is an indication of the importance of the studies that will be carried out using data science during the epidemic process. "In Data Sets; the number of deaths and the number of healing, data on sick individuals, data used to compare the covid-19 outbreak and other outbreaks, data from research conducted in the outbreak process and data on industry processes are recorded. Data sets created during the epidemic process; (COVID-19 (Coronavirus) Data Resource Hub, COVID-19 Complete Dataset, Corona Virus (COVID-19) Tweets Dataset, CORD-19: Semantic Scholar is used in many studies [11]." Improved artificial intelligence technologies transform the data obtained from the created data sets into information and produce results using the system developed in many different areas during the epidemic process.

4. PRODUCTS AND SERVICES DEVELOPED USING ARTIFICIAL INTELLIGENCE TECHNIQUES IN THE CORONAVIRUS PROCESS

In this section, recognition of the coronavirus, analysis of the data obtained using computed tomography, estimation of the spread rate of the virus, the possibility of drug development, the effect of the process on shipping companies and the advantages of using unmanned robots more actively are examined.

4.1. Artificial Intelligence Technologies Developed To Diagnose Coronavirus

As one of the leading e-commerce companies, Alibaba has developed an artificial intelligence technology to be used in the coronavirus outbreak process. Artificial intelligence technology, developed by the Alibaba Research Institute Damo Academy, which was established in 2017, allows the virus to be diagnosed.

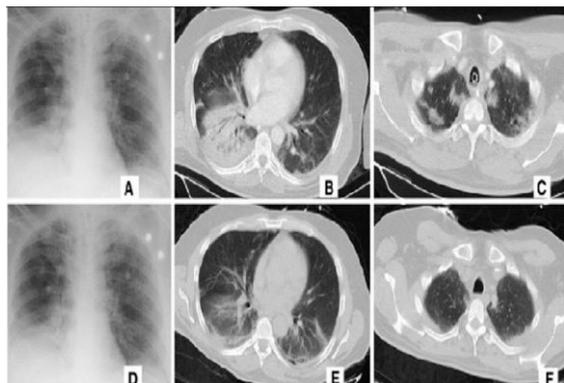


Figure 1. Sample image from Alibaba virus diagnostic system

It takes 20 minutes for the healthcare personnel who detect the virus to take more than 20 minutes to evaluate more than 300 images using classical methods. This situation; creates a problem in the prevention and control of the outbreak, the analysis of infected people with advanced software is carried out within 20 seconds. According to the results obtained, the artificial intelligence system used gave 96% correct results. Using the machine learning techniques in the artificial intelligence system developed to provide diagnosis of infected individuals, Alibaba Company trained the system with image data related to the patient individual who has been diagnosed with more than 5,000 coronavirus. At the same time, the software developed using expert system techniques provides diagnosis of infected individuals by producing results instead of doctors. Developed software is used in many health institutions according to the positive results obtained by testing in more than 100 hospitals in China. The software of Intervision Company, InferRead CT, which is the artificial intelligence provider, is an artificial intelligence supported software used to increase efficiency in the radiology department. After the virus spread rapidly, it was started to be used in an experiment to diagnose the virus in the radiology department of Zhongnan Hospital in China. With the developed software, lung inflammation symptoms associated with coronavirus were detected by CT scans. CT scans are publicly known tomography. InferRead CT software produces results by evaluating the images obtained with tomography scanning techniques.



Figure 2. Sample image obtained via InferRead CT software

With the InferRead CT software, it is provided to diagnose the virus in a short time through the images obtained by the patients' lung tomographs. The software has been used in more than 1500 hospitals and has played an active role in diagnosing more than 5,000 patients. Data is interpreted with the software used, analysis results are obtained in 15 seconds and a success rate of over 90% is provided. With the software, early detection of the virus and monitoring of the development of the disease were provided. The developed software helped healthcare professionals to diagnose, treat and monitor the disease, while reducing workload and saving time. Covid-19

disease can spread very quickly. The process of detecting the patient cannot respond to this rapid spread. Many studies have been carried out for this purpose, generally using deep learning techniques (such as CNN, DNN) to identify patients from x-ray or computed tomography. It has been observed that the obtained radiological data are very important and are used to create a model for the detection of the disease [13, 14]. Classification of many studies and labeling of the images were made. General information about performance analysis and accuracy rates was given by classifying the image processing process and artificial intelligence studies [15-17].

4.2. Artificial Intelligence Technologies Developed to Monitor the Coronary Virus (Covid-19) Outbreak Process

The global conditions screen developed by John Hopkins University System Science and Engineering Center based on artificial intelligence technologies is used to monitor the situation related to the coronavirus epidemic that is spreading all over the world quickly. The developed software allows access to information on the epidemic process worldwide. The data needed to produce results with the software used is obtained from the USA Centers for Disease Control and Prevention, World Health Organization, European Center for Disease Prevention and Control, China Disease Control and Prevention Center and China National Health Commission.

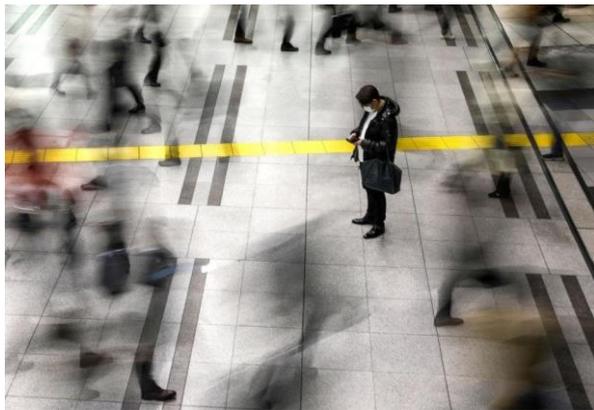


Figure 3. Example image obtained with BluesDot artificial intelligence technology

Artificial intelligence technology, developed by John Hopkins University, is the first source to follow the outbreak and is an AI based information service that communicates the outbreak worldwide. The developed technology enables full-time and up-to-date information sharing, including total number of cases, number of patients on a country basis, number of deaths and number of patients recovering. The technology developed uses an online map created using artificial intelligence techniques to provide information on the outbreak process. It is available on the global status screen web pages, providing individuals with accurate and fulltime information about

the outbreak. Another technology that enables monitoring the outbreak process is the COVID-19 monitoring map developed by Microsoft. The information transferred from the map prepared by the Bing team is presented by the software as a result of the data obtained from the World Health Organization, Disease Control and Prevention and European Center for Disease Prevention and Control databases.

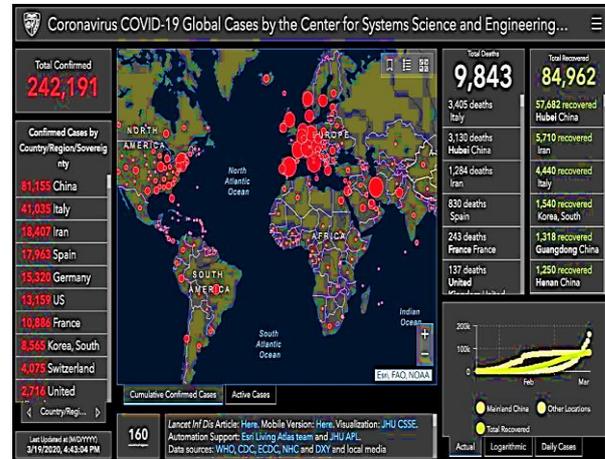


Figure 4. Example of Global Status Screen

The Microsoft COVID-19 monitoring map works faster and is easier to use on mobile devices compared to the map created by John Hopkins University. BlueDot company has developed an artificial intelligence-based software with the aim of reducing the spread of the virus with the risk software created for outbreaks at the point of protecting human health and safety. The developed software is designed to monitor, detect and conceptualize infectious diseases.

The BlueDot Company was the first to report a coronavirus (Covid-19) outbreak using software developed with artificial intelligence techniques [11].” The developed software is an early warning system against the epidemic. The health monitoring platform, developed with the focus of Artificial Intelligence, uses datasets made accessible for the outbreak process. The software transforms the obtained data into information using machine learning and natural language processing techniques and sends alerts in accordance with the results obtained automatically. BlueDot Insights, an automated global infectious disease risk assessment system developed using Artificial Intelligence techniques, reduces the risk of getting infected by sending an alert for the outbreak in real time. One of the methods of predicting the Covid 19 outbreak is time series methods. Auto-Regressive Integrated Moving Average (ARIMA) model has been developed to predict the spread rate of the epidemic and take measures [18].

4.3. Artificial Intelligence Technologies for Coronavirus Detection (Covid-19)

An important point that is emphasized during the coronavirus epidemic process is the detection of infected individuals. Accordingly, artificial intelligence-supported surveillance systems have been developed. “The purpose of using the artificial intelligence systems primarily is to identify the regions where the virus is intensely detected and to identify the patients in the region. In line with high fever of one of the symptoms of coronavirus, SenseTime has provided detection of individuals who show signs of disease by using facial recognition and temperature sensing technologies with the surveillance system developed using computer vision and machine learning techniques. With the developed artificial intelligence technology, it is aimed to identify individuals with high fever and the possibility of hosting virus. Thus, it is aimed to prevent the spread of the disease by identifying people with high probability of hosting virus. The developed surveillance system enabled detection of individuals showing signs of disease in human-intensive environments with artificial intelligence-supported thermal cameras and was used to control the outbreak in many regions of China [12]”.

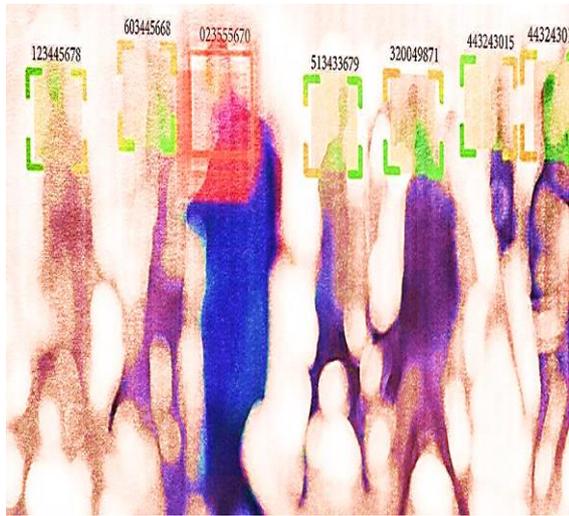


Figure 5. Sample image obtained with SenseTime software

Another study on disease detection was carried out by Hanwang Technology company. With the product developed based on artificial intelligence using facial recognition and temperature sensing techniques, body temperature, including masked individuals, was detected and individuals who were infected or showed symptoms were identified.



Figure 6. Sample image of the detection system developed by Harwang Technology

The developed artificial intelligence system produces results by measuring the body temperature after determining the identity of individuals. Accordingly, it was aimed to control the spread of the epidemic by identifying individuals whose body temperature was above normal. In the development of the software, 6 million unmasked face image data and image data related to masked faces were used using image processing techniques. With the cameras with face recognition technology created using artificial intelligence techniques, individuals who show signs of disease have been recorded and data regarding individuals have been reached. The cameras used have analyzed a large number of individuals in a crowded environment within 1 second and performed facial recognition. The biggest difference of the software developed by Hanwang Technology company from other applications is that it enables the detection of masked individuals. The developed software showed 99.5% success in those who wore masks and 95% success in those who wore masks. This is an indication that face recognition systems created using artificial intelligence technologies are developing and related systems have played an active role in the epidemic process.

4.4. Artificial Intelligence Technology Developed for Drug Development in Coronavirus (Covid-19) Process

Benevolent, a British IT company, is a company working on drug development during the coronavirus outbreak. The company aims to find the most appropriate medicine by evaluating the drugs that can be used in the treatment of the disease with the artificial intelligence technology it has developed. For the development of the software; First of all, the current literature on the fight against flu was examined. After the subject clusters were formed, the correlations between the clusters were calculated and the effect of the virus on the lungs was emphasized. Later, 378 drugs and their properties have been put into a list and the software developed has been

made ready for use to produce results. Based on this situation, AAK1 chemical that keeps the virus coming to the lungs under control and 47 drugs that interact with the existing drugs on the software were determined. As a result of screening processes, taking into account the side effects, effectiveness and other features of the drugs detected by the software; the drug used in the treatment of joint rheumatism called baricitinib has been found to be effective if the virus goes into the lungs. Defining the chemical structure of drugs with software developed using artificial intelligence techniques is an indication that new drugs can be produced quickly, cheaply and with high accuracy.

4.5. Artificial Intelligence Technology Used in Drone Transport in the Coronavirus (Covid-19) Process

During the coronavirus (Covid-19) pandemic, drone machines were used for four different services: control and monitoring, health supplies delivery, disinfection of common areas and fever measurement control. Using artificial intelligence techniques to visualize areas, drone machines have become powerful tools. In this regard, drone machines gaining talent with artificial intelligence technologies have played an active role in viewing dense areas during the epidemic and communicating with individuals in these areas. In accordance with the fact that artificial intelligence technologies are developed for human use in situations requiring human labor, drone machines enabled individuals to communicate with other individuals without contact with infected people. In addition, if individuals are obliged to stay at home during the epidemic process, increasing workforce in package and food delivery services has been reduced with drone package delivery services. Agricultural spraying drone machines have been developed in order to disinfect public spaces in order to prevent the spread of the virus. Another important point in the epidemic process is the distribution of critical medical materials. For this reason, efficient and effective distribution of medical supplies was provided by drone machines. Terra Drone company for medical supplies distribution; with the system developed based on artificial intelligence, it has provided fast, safe and hygienic delivery of medical products. As a result of the use of drone machines in the transportation process, the productivity time increased more than 50%. The effectiveness of drone machines during the epidemic process is an indicator that they are efficient tools that can be used to prevent and control the epidemic.

4.6. Robots Used in the Coronavirus (Covid-19) Outbreak Process

Considering the fact that robots are not affected by viruses, robots have been used instead of humans in order to prevent the spread of the virus in processes that require communication between people in the epidemic process. Developed by Blue Ocean Robotics Company, UVD Robots emits ultraviolet rays and eliminates viruses.



Figure 7. UVD robot

The developed UVD robots break down the DNA structures of the virus and disinfect it for 10 minutes to prevent the virus from spreading. UVD robots used in hospitals target bacteria with UV-C rays emitted by autonomous movements. UVD robots used instead of cleaning personnel during the epidemic have achieved 99% success in killing viruses.



Figure 8. Food Delivery Robot

Another technology developed during the epidemic is robots that distribute food rather than people in situations that require close contact between patients and staff. Accordingly, robots developed by Pudu Technology company provide food delivery services in 40 hospitals in China. Robot technologies have become one of the important tools that efficiently serve in the epidemic process.

5. CONCLUSIONS

In this study, the artificial intelligence techniques used in the development of artificial intelligence technologies are explained in order to analyse the products and services developed using artificial intelligence technologies during the coronavirus (Covid-19) epidemic process. Following the disclosure of artificial intelligence techniques, considering the effectiveness of data science in the epidemic process, data sets used in the related process are included. As a result of observing that artificial intelligence technologies were applied in many different areas and products and services were developed during the epidemic; Artificial intelligence technologies that are widely used during the epidemic have been explained. For the corona virus (Covid-19) outbreak; Artificial intelligence technologies have been used effectively in controlling the epidemic, preventing the epidemic and in health services performed during the epidemic. Regarding this situation; Diagnosis of sick individuals, obtaining information about the epidemic process, detection of infected individuals, development of drone technologies, drug development and robot technologies were developed using artificial intelligence techniques. Developed technologies; Artificial intelligence technologies used in order to reduce the need for human workforce, to allow rapid results in the studies carried out during the epidemic and to prevent the spread of the epidemic provided an advantage in managing the relevant process considering the practices discussed in the study. Artificial Intelligence science has been an important tool for controlling the coronavirus (Covid-19) epidemic process and preventing the spread of the epidemic.

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