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## ARTIFICIAL INTELLIGENCE PRACTICES IN THE HEALTH SECTOR

### Summary

Artificial intelligence is a technology developed to make machines think like humans. Aristotle's historical artificial intelligence entered the health sector in the 1970s. The first application for artificial intelligence in the internist-1 field in health care, the Casnet expert system, and MYCIN. This technology was later introduced to many areas of health care. The main purpose of this application is for the benefit of doctors and patients. In general, applications, medical decisions, early diagnosis and treatment, drug development, and medical imaging issues deserve attention. Another important issue is the concern about the benefits of artificial intelligence, as well as the possibility of replacing the physicians in charge when medical decisions are left entirely to artificial intelligence. This study aims to provide readers with general information about the areas where artificial intelligence is used in health care. In this study, 14 applications were examined and outstanding results were observed. When doctors say that a comatose patient cannot wake up, artificial intelligence says that a comatose patient can wake up and the patient can wake up. Other advanced artificial intelligence has shown that it can detect cancer more accurately than 58 skin specialists. One study concluded that artificial intelligence with a predictive treatment approach lowered health care costs by 5 to 9% and could lead to an increase in life expectancy of 0.2 to 1.3 years.

**Keywords:** *Artificial Intelligence, Health Practices, Health Management*

### 1. INTRODUCTION

The idea of making things think like humans have been puzzling human beings for a long time. This idea is based on documents belonging to Aristotle, who lived between 384 BC and 322 BC. In these documents, evidence has been reached about Aristotle's examination of how human beings think. Artificial Intelligence (AI) studies based on Aristotle have come to the present day.

Although important developments have been made in the field of Artificial Intelligence today, the research level is still in the incubation phase. With each passing day, artificial intelligence researchers are revealing new inventions and innovations that will help redefine artificial intelligence. Some even say that artificial intelligence is an absolute concept that is impossible to define by looking at these developments [1]. However, when looking at the general definitions, artificial intelligence can be defined as technologies developed for machines to think like human beings.

Despite the introduction of artificial intelligence in the field of health in the 1970s and other technological developments in the field of health, it is seen that applications that are thought to be outdated such as fax machines are still used. Cardiologist Dr. According to Eric Topol, the period in which these old applications were used was delayed, but with the artificial intelligence revolution, they took action to catch up with the latest technologies. Dr. Topol is optimistic about the future of medicine. Dr. According to Topol, artificial intelligence will be very useful especially in repetitive and error-prone tasks such as picture screening, detailed heart monitoring, or recording the doctor's diagnoses in the patient records. In this way, by processing large amounts of data, optimal treatment will be provided for patients and the workflow in hospitals will be improved. Dr. According to Topol, artificial intelligence will not be able to replace communication with patients. Although it is thought that artificial intelligence applications that reduce expenses, save time and prevent mistakes cannot replace the communication between the patient and the doctor, this thought does not mean that humanity cannot be imitated in the future [2].

This study aims to give an idea to the readers about the applications in which artificial intelligence is used in the field of health and to show the negative aspects as well as the beneficial aspects. The data of the study are composed of websites, articles, and videos. In the first part, a brief history, definition of artificial intelligence, and generally used techniques of artificial intelligence will be discussed. In the second part, a general introduction to the place of artificial intelligence in the field of health will be made, and examples of

its applications in different subjects in the field of health will be given. The third part will include concerns about artificial intelligence in the field of health, and the final part will be the result and the presented future vision.

## 2. ARTIFICIAL INTELLIGENCE (AI)

The history of artificial intelligence (AI) is based on Aristotle, who is the owner of the documents that have been dealing with how human thought is, how it can be formalized, and how the algorithm of thought can be written [3]. The emergence of AI in the real sense emerged with the creation of the machine intelligence test by Alan Turing, one of the best names of computer software that emerged with the Second World War, the famous mathematician and a computer science expert. This application, called the Turing test, is based on the controversial assumption that if a human cannot distinguish between a human and a computer during the interaction, then the computer should be considered as smart as a human. While some chatbots are said to have passed the test, such as Eugene simulating a 13-year-old Ukrainian boy, no AI system has yet managed to pass this test. However, this will continue to be discussed in the future even if it succeeds in passing the test [4]. The period when AI emerged as a separate research area is accepted in the mid-1950s. Marvin Minsky, Allen Newell, Herbert Simon, and John McCarthy attended a seminar held by IBM at Dartmouth College in 1956. John McCarthy is the first person to call this field artificial intelligence. Therefore, those who attended this meeting were deemed to be the pioneers of AI in later periods [5]. It emerged in studies in the field of health in the 1970s. Internist-1, CASNET, and MYCIN are the first AI systems used in medicine [5].

Artificial intelligence; By Say (2018), artificial systems with bodies, if necessary, that can perform cognitive activities such as making use of past data, perception, discrimination, learning, planning and organization, numerical reasoning, movement, even moving objects, recognizing sounds. It is defined as the branch of science that examines how to achieve high-level success. Based on this definition, it can be said that artificial intelligence is a technology that enables machines to produce solutions to complex problems like humans and to imitate the way people think [6]. Artificial intelligence technology is developing more and more every day. New products are emerging and more manifest in daily life. Equipped with artificial intelligence technology in automation systems, the decision-making power of the computer is used. More and more commercial systems are emerging day by day and the functional features of the systems are increasing. To briefly mention the techniques related to artificial intelligence technologies, six main areas stand out.

- Expert systems: These are systems that are equipped with expert knowledge and that produce solutions to problems as an expert solves the problems. Inference mechanisms make decisions by establishing relationships between information.

- Artificial neural networks: They are systems that are similar to the information processing process of the human brain that learns the relationships between events from examples and then make decisions using the information they have learned about examples that they have never seen. They enable computers to learn.

- Genetic algorithms: They have been developed to solve problems that cannot be solved with traditional optimization technology. It is based on the philosophy of creating better solutions by combining the solutions of the problems.

- Fuzzy propositions logic: It is a technology that facilitates uncertain information processing and decision making in situations that cannot be expressed with exact numbers.

- Intelligent factors: These are systems that can use different artificial intelligence techniques and work independently. They are programmed flexibly.

- Pattern Recognition: It is a technology that helps to recognize patterns that are continuous and repeating shapes [7].

The overarching terms that make up artificial intelligence, machine learning, and deep learning should also be mentioned. If we briefly define these two concepts, machine learning is the algorithm that enables the machine to derive logical and rational results with the data provided. Deep learning works like neurons in our brains and creates its own rules. For example, while we introduce the properties of grape in machine learning, in deep learning, the algorithm can distinguish which is a banana and a grape by its own processes [8]. Artificial intelligence applications have started to be the applications we use frequently in our daily lives. It has started to enter almost every area of our lives. However, in this article, its applications in the field of health will be discussed.

### 3. ARTIFICIAL INTELLIGENCE IN THE FIELD OF HEALTH

It is known that with the introduction of artificial intelligence in the field of health since the 1970s, it has witnessed significant developments in medical decision making, medical imaging, early diagnosis and treatment, storage of medical records, drug development, and many more.

According to the data of Economic Cooperation and Development Organization OECD, 20% of health expenditures are wasted worldwide [9]. Health expenditures per capita are high and it is seen that the biggest reasons for this are due to system inadequacies such as not diagnosing the correct disease, inadequate care services, unnecessary procedures, and unnecessary treatment. AI technologies are capable of creating an ecosystem that will prevent these causes by making a faster diagnosis, correct treatment, and more effective decisions by taking advantage of the power of data. Looking at the AI technology studies in the field of health; Early and accurate diagnosis, correct treatment, studies that will help doctors to make the right decisions support their ability to prevent the causes of health expenses. Repetitive, uncomplicated tasks such as analysis of computed tomography (CT) scans and specific tests can be done more accurately with AI-enabled systems, and early diagnosis and interventions may be possible before conditions become critical by reducing doctor error [10]. The Centerstone Research Institute conducted a study that concluded that diagnosing using artificial intelligence is cheaper than a traditional diagnosis. This study was conducted by comparing simulations, physical performances, and disease outcomes of 500 randomly selected patients with the sequential decision-making models of artificial intelligence. It turned out that there is a large difference in costs per unit. While AI models cost \$ 189, the usual methods cost \$ 497 [4].

AI has the potential to truly empower us as individuals to make better decisions about our health. Large numbers of people around the world use wearable technology to gather daily information from their sleep patterns to their heartbeat. With the data collected with these wearable technologies, it can inform people at risk of certain diseases before these risks become critical by deriving logical and rational results with machine learning. Mobile apps can provide detailed patient profile information that can help people living with specific chronic conditions to better manage their illnesses and lead healthier lives. All of these can lead to healthier populations and a reduction in the overall cost burden [10]. Various applications with AI technology have been developed and continue to be developed in the field of health to prevent unnecessary treatments, diagnosing before the disease becomes critical, analyzing various scans in a shorter time, helping doctors to make the right decisions, and enabling patients to manage their diseases themselves.

#### 3.1. Artificial Intelligence Applications in Healthcare

In the field of health, AI technology is used in many areas of health to benefit patients and doctors in general. In this section, fourteen applications have been examined to show in which areas AI technology has been developed in the field of health. These fourteen practices have been categorized as those with general content and specific applications based on disease.

##### 3.1.1. IBM Watson

Since IBM Watson is considered one of the pioneers of artificial intelligence in the field of health, examples in this study are started with him. IBM Watson; Jeopardy, which can perceive the natural languages spoken by people instead of artificial languages in programming, can produce high accuracy, relevant and fast answers to questions asked, and at first especially Jeopardy! While it was a computer designed for a quiz game, it is a platform that goes far beyond a computer. The most important factors that make Watson special as an artificial intelligence application are that this system processes and presents real-time data, produces personalized solutions, predicts possible diseases by integrating all health records of the person, and offers models to improve public health. In this respect, it can be said that he adopts the "there is no disease, there is a patient" approach. No matter how much data is supported, Watson can continuously optimize its decision processes. It is possible to group the solutions offered by Watson in the field of health under five headings. These;

1. Optimizing service performance,
2. Management of service users,
3. Improving public health,
4. Effective presentation of health services,
5. It is the solution to health problems.

The services mentioned in the above five headings are provided by the programs that are sub-modules of these companies. Some of the prominent modules are IBM Explorys, IBM Phytel, Watson Care Manager, TH Micromedex, TH CareDiscovery, TH PortableAnalytics Suite, TH MarketExpert. For example, the IBM

Phytel program can list patients whose diseases should be treated with priority, can make groupings according to risk factors, and provide full monitoring of patients' clinical follow-up and planning of interventions. It provides scheduling of patient follow-up, can integrate stakeholder data, and create personalized reports [11]. In a study in a hospital group serving 200,000 cancer patients annually in India, the diagnoses of Watson on breast cancer cases 90% overlapped with the recommendations of the cancer board summarize, IBM Watson's health work areas; It can be said that it is a solution to health problems by conducting researches in oncology research, providing personal health services (producing personalized solutions), making new drugs, predicting diseases with real-time data, offering models that increase service performance and improve public health.

### ***3.1.2. Cancer Detection Applications***

#### ***3.1.2.1. Skin Cancer Detection***

A study has been published in the Annals of Oncology journal showing that AI can now diagnose skin cancer more accurately than experts. Skin cancer is a very common disease today. The accurate and early diagnosis of skin cancer depends on the knowledge and experience of doctors. Early diagnosis and correct diagnosis of skin cancer are very important. Artificial intelligence technologies make this easy. With artificial intelligence integrated into imaging technologies, benign tumors can be filtered, suspicious tumors can be detected and access to experts can be provided. The number of patients with skin cancer is also high, and the supervision of these patients is a burden for doctors. Artificial intelligence can also be a solution to this [12]. For these reasons, the team conducting the study has taught the machine to distinguish benign from malignant ones by showing more than 100,000 images to an in-depth learning evolutionary neural network or CNN [13]. In the study, they have shown that artificial intelligence can detect cancer more accurately than 58 skin experts. While doctors made the correct diagnosis by 87%, machines reached a rate of 95% [14]. Thanks to this developed technology, skin cancer patients can be diagnosed earlier and the correct treatment can be applied. Also, the developed machine can be a solution to the problem of supervision of patients by forwarding suspicious tumors to experts and thus reduce the burden of doctors. Applications have been developed for other types of cancer using the same techniques.

#### ***3.1.2.2. Mesothelioma (Lung Cancer)***

In some regions in Turkey, mesothelioma (cancer of the pleura) is seen as more risk [15]. In the study of Er et al., the artificial immune system was used for the diagnosis of mesothelioma, and the artificial immune system results were compared with the multi-layered artificial neural network results using the same database and focused on the diagnosis of Mesothelioma disease. A performance of 97.74% accuracy has been achieved for disease diagnosis by the artificial immune system. This system can provide the specialist with a good performance in finding the correct diagnosis in the process of classifying the healthy and sick person. Thus, with this structure, it can help doctors as a decision support system in reaching the correct diagnosis result. Also, this study has proven that artificial immune system (AIS) technology can be performed with heart cancer, abdomen, or, most commonly, lungs [16].

#### ***3.1.2.3. Breast cancer***

Breast cancer is the most common cancer in women [17]. That is why artificial intelligence software that can accurately predict breast cancer risk has been developed by researchers at the Houston Methodist Research Institute in Texas. The software intelligently reviews millions of records, enabling more efficient determination of breast cancer risk using the patient's mammography. The team that developed the software used AI software to evaluate breast cancer mammography and pathology reports from 500 patients. As a result, AI software has been found to access diagnostic information 30 times faster than a human doctor with 99% accuracy. It is predicted that it will be possible to prevent unnecessary biopsy with the software [18].

### ***3.1.3. Eye Health Application***

DeepMind and Moorfield Eye Hospital NHS Foundation have developed a project using artificial intelligence technology to assist clinicians in the early diagnosis and diagnosis of eye diseases that cause eye loss. As the reason for this research, they stated that eye vision loss is a worldwide problem and affects 285 million people and that this figure will triple by 2050, so it is possible to prevent these diseases by early diagnosis and treatment with artificial intelligence technology as a solution to these diseases. Also, eye scans are optical coherence tomography (OCT) to help diagnose eye diseases. Well-trained experts are required to interpret OCT results, and these scans take a long time to result. They also worked on artificial intelligence

technology to make this scanning process much more efficient. And the AI technology they developed as a result of their studies can analyze OCT eye scans and accurately suggest how patients with a wide range of eye diseases such as age-related macular degeneration, diabetic eye disease, and severe myopia should be directed for treatment with 94% accuracy. This matches the accuracy of expert clinicians at Moorfields Eye Hospital with over 20 years of experience. Also, this AI technology can help ophthalmologists by providing information to doctors about the characteristics of the eye disease identified in the OCT scan. This technology has been trained in algorithms using thousands of OCT scans and can be applied to other scans using neural networks [19]. DeepMind says that after the completion of clinical trials if the system is guided for general use, 300,000 British patients can be helped annually [15].

#### ***3.1.4. Preventing Negative Consequences with Artificial Intelligence***

Humans spend more time than machines to analyze very large data. Montefiore Health System in New York, in collaboration with Intel, has commissioned AI solutions and analysis to see common patterns in vast amounts of patient data to provide a more effective service to various patient populations, so this organization can advance patients at risk of developing acute illnesses. can detect and treat early with less cost [20].

#### ***3.1.5. Drug Development Applications***

According to Gray, one of the sectors that benefited from artificial intelligence technology was the pharmaceutical industry. Artificial intelligence technologies can analyze data from a wide variety of sources, such as clinical trials, patient health records, and genetic records, and can help predict how a drug might affect a person's cells and tissues. With this help, it can lead to better experimentation and pave the way for customization. This more streamlined process can lead to faster marketing of drugs. In the report published by CBInsights, leading pharmaceutical companies such as Pfizer, Novartis, Sanofi, GlaxoSmithKlein, Amgen, and Merck announced in recent months that they have partnered with AI initiatives aimed at discovering new drug candidates for a range of diseases from oncology and cardiology. Pfizer has entered into a strategic partnership with XtalPi (an AI organization), backed by tech giants such as Tencent and Google, to predict the pharmaceutical properties of small molecules and develop "computational rational drug design." With BigPharma's interest in artificial intelligence, it has been observed that exploration opportunities have increased since 2017. The number of share agreements starting from the first three months of 2013 until the end of the second sixth month of 2018 has been examined. BigPharma's interest in the field increases the number of stock deals and this causes new starters to turn to drug discovery opportunities. Since the fourth month of 2018, the number of stock deals has been equal to the sum of twelve months in 2017.

Apart from drug development, there are opportunities offered by artificial intelligence in the pharmaceutical industry. One of the largest mergers and acquisitions agreements in the field of artificial intelligence, Flatiron Health, which is purchased by Roche Holding, collects patient data using machine learning and researches by analyzing data in electronic medical records and other sources to determine the benefits and risks of drugs with this data. They also aim to collect RWE (real-world evidence) to monitor post-marketing drug safety and help design better clinical trials and new treatments in the future [21].

#### ***3.1.6. Computer Knowing When A Coma Patient Will Wake Up***

Doctors developing an artificial intelligence technology in China stated that they told 7 patients in Beijing, who was said to have no hope of reaching consciousness, that the developed artificial intelligence technology would awaken, and that this was realized. Also, 5 patients whose doctors and the computer said that they could not wake up. For example, for a 19-year-old patient, doctors performed 4 evaluations and gave 7 points out of 23 points on the scale of getting out of a coma for families to decide to end their life. However, the developed AI computer gave this patient over 20 points after brain scans, and this 19-year-old patient awoke as AI said. There have been cases where this technology developed in 7 years has made mistakes. A patient who both doctors and the computer said cannot wake up woke up. Doctors conducting this study in China think that this technology will help make better decisions. Neural activities are too numerous and complex to be directly visible to doctors, but the AI system equipped with machine learning algorithms examines these changing details and manages to discover previously unknown patterns from past cases [22].

### **3.1.7. Medical Imaging**

#### **3.1.7.1. CT Scans IBM**

According to IBM research, radiologists and cardiologists must examine hundreds of images a day to diagnose the disease. This process takes too much time and can cause errors by causing eye strain. With the Medical Sieve (MS) project led by TanveerSyeda-Mahmood, it was designed as an assistant to help radiologists and cardiologists to quickly detect anomalies in scans using entry-level image recognition. MS's philosophy in developing cognitive assistants is to make systematic modeling of the radiologist's interpretation process by bringing together multiple aspects of artificial intelligence from multimodal image and text analytics, deep learning, clinical knowledge, and clinical reasoning technologies. Attention is also paid to the seamless integration of these technologies into the clinical workflow. This comprehensive approach to building practical systems based on the team's solid theoretical research in AI-related areas is significantly different from the work of other researchers who focus on one or more aspects of AI [23].

#### **3.1.7.2. Enlitic**

Enlitic has been developed to assist doctors. Using deep learning technology, it can analyze a wide variety of unstructured medical data such as laboratory results such as radiology and pathology images, blood tests and ECGs, genomics, patient histories, and electronic health records (EHRs). This richness provides higher accuracy and deeper information for every patient. Networks of artificial neurons analyze large data sets to automatically discover basic patterns without human intervention. Enlitic's deep learning networks examine millions of images to automatically learn to identify disease. Enlitic's artificial intelligence interprets medical images in milliseconds, which is about 10,000 times faster than the average radiologist's medical image interpretation performance. Also, although three radiologists reported at the same time in a test, the Enlitic system was 50% more accurate and faster in classifying malignant tumors [24].

#### **3.1.7.3. Butterfly Network iQ Medical Imaging Device**

The goal of Butterfly Network, the start-up founded by Jonathan Rothberg in 2011, is to create a significantly inexpensive and efficient new medical imaging device from MRI and ultrasound. The ultimate goal of the initiative is to automate the medical imaging process [25]. With these goals, a device called IQ, which is portable, rechargeable, compatible with tablets and phones, has been developed. IQ has been developed as a device that enables real-time collaboration and scanning of 19 regions of the body by providing unlimited storage, unlimited private archive, internal battery, wireless charging, access to data from anywhere, enabling patients and doctors all over the world to deliver images [26].

### **3.1.8. Predicting Depression and Mental Health Disorders**

Mindstrong Health is a company that changes the diagnosis and treatment of neuropsychiatric disorders. Cognitive function to provide better mental health service; They aimed to measure brain health, which is quantitative, reproducible, continuous, and objective. For this, they defined digital biomarkers that can predict performance in standard cognitive function tests. Participants in the study first completed a three-hour comprehensive neurocognitive assessment led by a psychologist. After the evaluation, Mindstrong's application was installed on the participants' phones. For the study, the Mindstrong application collected sociality data such as human-computer interaction data, GPS (global positioning system), sensor and daily e-mail, SMS, and phone calls. The study collected data for a year and showed that although GPS, sensor, and social data in the study population revealed little, human-computer interaction data showed a strong correlation with current gold standard cognitive function tests. Also, the study showed that these correlations can be established based on seven days of user-device interaction data [27]. Company founder Dr. Thomas R. Insel said, "Data obtained from a smartphone can give an idea of how we think, feel and act" [15].

According to the World Health Organization (WHO), depression is a common mental illness, and more than 300 million people of all ages suffer from depression [28], and AI shows promising signs of helping alleviate symptoms of depression. For example, another study on this topic is Woebot [29], a chatbot designed according to the principles of cognitive-behavioral therapy. In the trial conducted by Fitzpatrick et al., [36] a text-based self-help content derived from the principles of CBT (cognitive behavioral therapy) in a conversation with 34 participants of a group of 70 people aged 18-28, online from a social media site of a university A 2-week (up to 20 sessions) session was applied with Woebot, a speech agent. "Depression in University Students" was directed to the National Institute of Mental Health e-book as only the information control group of the remaining 36 people. All participants initially completed the web-based versions of the 9-item Patient Health Questionnaire (PHQ-9), the 7-item General Anxiety Disorder Scale (GAD-7), and the

Positive and Negative Impact Scale 2-3 weeks later. In the study conducted for 2 weeks, the effect of PHQ-9 applied in reducing depression was observed on two groups. According to the results obtained at the end of the trial, it was concluded that the participants in the Woebot group significantly reduced their depression symptoms during the study period as measured by PHQ-9, and a significant group difference emerged on depression.

### ***3.1.9. Xiaoyi Smart Doctor Assistant and Medical License Exam***

Xiaoyi, which means "Little Doctor" in China, was developed by iFlytek together with Tsinghua University. Xiaoyi became the first artificial intelligence robot to pass the exam in the time given to complete the exam [30]. At first, he barely got 100 points out of the 600-point medical license exam, with a passing grade of 360, which was put into the examination by rote method only. After a while, they used the clinical and diagnostic expertise of medical professionals to change the robot's algorithms. Later in August, Xiaoyi was put to the real test at the same time with other doctors by taking the digital version of the exam supervised by the National Medical Examination Center, according to the Xiaoyi report, and WuJi, deputy director of Tsinghua's electrical engineering department for the robot, which scored 456 out of 600 points, said that the machine's score was learned by itself. He said that he showed that he had the ability to reason and make decisions. He also stated that he has a long way to trust Xiaoyi completely. WuJi said, "What they can do most right now is to advise doctors to identify problems faster and avoid some risks" [31].

### ***3.1.10. For the Education of Children with Autism: OTSIMO***

One of the best social enterprises in the world, OTSIMO co-founder Hasan Zafer defines autism as a lifelong mental disability that starts before the age of three, damages communication, creates social disorders, distraction, and learning disabilities in individuals with autism. He states that there is no cure today because the cause cannot be found, and the only solution is education. According to their research, one and a half of a hundred children have autism and this corresponds to three times as many autistic patients when all cancer types are added, and therefore autistic children should receive different education and this education is burdensome, and not every autistic person can access this education [32]. Therefore, the reason for the establishment of OTSIMO is that every autistic person can access education, the education burden can be reduced and at the same time, they can be educated in their families. They provide this with a smart mobile training platform application. OTSIMO Kids is a free application that includes educational games. There are 18 games in the application. Moreover, 2 more games are added every month. For this, you just need to update the application from time to time. Of course, all of the games are educational games specially developed to contribute to the development of children. "Especially autism education is very suitable for this because it is analysis-based." Again, since autism is a spectrum disorder, we need to understand the situation of children from the children themselves, not their age or class. This sets us apart from previous educational practices, "he said. OTSIMO offers control to families with artificial intelligence. Thanks to the games in the application prepared based on "Applied Behavior Analysis" (ABA: Applied Behavior Analysis), special statistics are created according to the style of the child, and recommendations are given. Thanks to this artificial intelligence, a completely child-specific learning method are formed [33].

## **4. CONCERNS AND NEGATIVES ABOUT ARTIFICIAL INTELLIGENCE**

As can be seen from the examples described, artificial intelligence has many applications in the health sector and has many benefits for health professionals and patients. These applications have been created for purposes such as being useful to people. However, there are serious ethical concerns regarding the use of artificial intelligence in medicine. The most common of these is responsibility anxiety. If clinical AI makes a serious mistake, the question of who should be held responsible is a matter of debate. Nowadays, similar technologies such as surgical robots may not be a problem as the last word belongs to medical professionals, but there are concerns when considering the possibility of artificial intelligence making its own decisions by ignoring our decisions [4]. In the report titled "The Cycle of Emerging Technologies" published by Gartner in 2013, it was argued that the most promising path for the future will be human-computer teams working together [34] (Gartner, 2013).

Some obstacles make it difficult for people to work with machines. Because these technologies do not reflect the way we think about our problems, there is a cognitive dissonance that makes it difficult for people to work with machines. Difficulties may be encountered in putting artificial intelligence and innovative technologies into real-world clinical practice [4].

There are some concerns in the results obtained from the studies. For example, some concerns have been

expressed in the detection of skin cancer. Some lesions are not visible and may require more extensive examination. It is stated that AI should be used as a support tool [13]. For another example, a machine that knows whether patients in a coma can wake up or not, it has been observed that patients cannot fully trust them and wait for their patients to wake up. Considering the results that artificial intelligence also made mistakes in the team that developed the machine, they emphasized that the decision should not be left entirely to artificial intelligence, but only to help doctors and patient relatives in making better decisions [23].

## 5. CONCLUSION

It has been tried to explain useful examples of artificial intelligence that stand out more than the application areas in the field of health and are more up-to-date. In this field, there are artificial intelligence technologies developed in addition to these examples. But it was not possible to reach all of them. The aim is to provide information about the applications in which areas and purposes in the field of health. With this article, it has been tried to contribute to the literature by classifying and showing the areas in which artificial intelligence is used and its promise in the field of health. To contribute to the readers and researchers in terms of gaining an idea about the current situation of the sector and its future orientation in these fields, it is aimed to give general information by explaining application examples.

Looking at the artificial intelligence applications in the field of health, if it is desired to make a general classification; Issues such as medical imaging, medical record, pharmaceutical industry, robot applications, big data analysis, early diagnosis, and treatment, ensuring faultless application, and avoiding unnecessary treatments come to the fore. In addition to these issues, there are also mobile-applied artificial intelligence technologies developed for the treatment of a disease, as in the OTSIMO example. Also, it would not be surprising to use artificial intelligence technologies in more creative subjects that can improve cognitive activities in the field of health. The aim of developing artificial intelligence applications in the field of health is to benefit doctors and patients.

Since human health is in question in the field of health, the benefits of artificial intelligence are important. For example, breast cancer is the most common cancer in women. In the researches carried out by Florence Nightingale Hospital, it has been shown that the incidence of breast cancer in our country has more than doubled in the last 20 years. It is estimated that this increase will be more and more, and approximately 25,000 women will be diagnosed with breast cancer annually and one out of every 8 women will develop breast cancer. Begin to appear from the age of 25 in Turkey and average breast cancer incidence increases with age. In the 45-49 age group, it forms 16.7% of all breast cancers by peaking. The absence of a widespread population-based screening program causes the rate of stage 0 breast cancer to be around 5%, stage I breast cancer to 27%, and stage II breast cancer to 44%, in other words, to be diagnosed at an advanced stage. In developed countries, the rate of stage 0 breast cancer is 4-5 times higher than ours, and the rate of stage I (early stage) breast cancer is 2 times higher. It is understood from these data how important early diagnosis is. And artificial intelligence can offer a solution to this. In a study, it was concluded that artificial intelligence provides a 5-9% reduction in health expenses with treatment prediction approaches and may cause an increase in the average duration of 0.2-1.3 years [35].

Besides these vital benefits, there are various concerns. No development in the field of artificial intelligence to date has finally produced a truly intelligent entity as most people literally imagine. But that doesn't mean that highly intelligent better formations will not be designed soon. Dr. Stanley M. Shaphay questioned whether artificial intelligence could really be the future of medicine. His idea is that, after an assessment of advanced computer technology or artificial intelligence, it is necessary to integrate it into modern medicine, possibly as an adjunct rather than in place of the doctor. Because the doctor believes that the therapeutic value of the patient relationship is such a powerful drug that smart machines cannot replace it [4].

The vision of the future, without ignoring the worries; In the report titled "The Cycle of Emerging Technologies" published by Gartner in 2013, it was argued that the most promising path for the future will be human-computer teams working together, as humans and machines will work together, and machines will be developed to help people. and all the benefits of artificial intelligence technology in the field of health should be used.

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