RESEARCH ARTICLE

THE APPLICATIONS AND POSITION OF ARTIFICIAL INTELLIGENCE IN HEALTH AND MEDICINE: A SHORT REVIEW

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Abstract

In our developing and changing world, as in every field, technological breakthroughs, investments, and software have shown significant improvement in the health and medicine sector. As specialized software has made an enormous leap forward in the health sector, the health system has become more modernized, technological, and functional. With technological development, diagnosis and treatment became more accessible, and more positive results were obtained. Modernized hospitals and health institutions have been established with the development of Artificial Intelligence (AI) technology. In these modernizing health institutions, much healthier results are obtained with robotic surgical procedures, and faster recovery is achieved in patients with minimum error margin. In this study, the importance of AI technologies in medicine and health, the innovations, application areas, advantages-disadvantages, and artificial intelligence studies used in the fight against Covid-19 were examined. Among these applications, Virtual Reality, Augmented Reality, Artificial Intelligence Supported Chatbots, Virtual Nursing Assistants, Natural Language Processing, and Surgical Operation Support Robots are discussed.

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1.INTRODUCTION

Artificial intelligence is a field in which the most severe and intensive studies are carried out globally. Artificial intelligence has entered almost every area of our lives and has made a significant breakthrough in the health sector. Artificial intelligence is a set of software and hardware systems with many abilities, such as exhibiting human-like behaviors, numerical reasoning, movement, speech, and sound perception. In short, artificial intelligence enables computers to think like humans. Machine Learning (ML) and AI will impact doctors, hospitals, and many others working in healthcare.

The critical development to brought by artificial intelligence has been the diagnosis of diseases. One of the best examples of this issue is the "23andME" application, which has a structure that can diagnose genetic diseases of people with saliva.[1] With this application, the genetic maps of the individuals are obtained, and the potential for cancer in the family structure can be predicted in advance. Medical education is a very long, challenging, and experience-based education process. With artificial intelligence technologies, medical students learn more effectively and quickly by contributing to their education. On the other hand, artificial intelligence can access all the articles that have been published in the health sector and the reports of all the cases that have emerged over the diseases and can learn very quickly. When we compare it with the human brain, artificial intelligence makes examinations and diagnoses incredibly quickly. Machine learning supports deep learning, evaluates all data that can reveal the leading causes of the disease, and finds its relationships. In addition, this information makes it much more effective in the next diagnosis. Medical decision making, early diagnosis and treatment, developmental disease detection, drug development, evaluation of radiology images, and medical training have become relatively easy with the help of artificial intelligence technologies.

In addition, these technologies can detect breast cancer, brain tumor, lung cancer, and skin cancer early. [2] Vision disorders such as nearsightedness (hypermetropia), farsightedness (Myopia), astigmatism can be treated with smart laser eye surgery. In addition, cataract patients can be healed with intraocular smart lens surgeries.With the simulations used in dental health, virtual reality, and patient robots, dental students prepare themselves for clinical experience by experiencing real patient experiences before clinical treatment.Artificial Intelligence (AI) refers to technologies that allow computers and machines to simulate human intelligence. [3] There are applications of AI in medicine, represented by mathematical algorithms and Machine Learning (ML), that enhance learning. There are three types of machine learning algorithms: (i) reinforcement learning, (ii) unsupervised, and (iii) supervised [4]. The second application of AI in medicine includes medical devices, physical objects, and increasingly complex robots (carebots). [4, 5]

With the use of analytical methods, AI can diagnose, detect, prevent and treat a wide variety of diseases. AI

algorithms are often trained on a large volume of data generated from healthcare activities such as diagnosis, etc. [6]

Farooq et al. [7] presented framework based on deep learning and detects Alzheimer's from MRI scans. Divya et al. [8] aimed to create a medical chatbot using AI to diagnose the disease. Berrouiguet et al. [9] designed a system to extract clinical meaning from digital footprints based on the advanced ML to identify suicide risk. Raja et al. [10] presented an AI-driven model in predicting the Aedes outbreak. Reddy et al. [11] proposed a governance model that aims to address the ethical and regulatory issues and stimulate further discussion about the governance of AI in health care. Kumar et al. [12] proposed a collaborative framework by using AI-internet of things (IoT) in the COVID-19 pandemic situation for healthcare workers.

Ćosić et al. [13] proposed a methodology for predicting mental health disorders induced by the COVID-19 pandemic among health care workers. Singh and Kaur [14] presented fog-assisted IoT based on the service quality framework to fight COVID-19. Bekhet et al. [15] showed an AI-based technique for early COVID-19 diagnosis from chest X-ray images using medical knowledge and deep Convolutional Neural Network (CNN). Kumar and Rana [16] proposed integrating AI with detection techniques to check anti-human microorganisms on various surfaces or in the environment. Their tool can also detect contagious diseases, including the flu, the common cold, Ebola, Hantavirus, etc. Choudhury and Perumalla[17]implemented the CNN on breast cancer image data set to identify Invasive Ductal Carcinoma (IDC) for detecting breast cancer. Mansour et al.[18] presented an AI and IoT convergence-based disease diagnosis model for intelligent healthcare systems.

We can examine some usage areas of artificial intelligence. AI is only used for routine in robotic surgery steps in simple procedures. AI is used in clinical decision-making. Hospitals offer tools for applications, but they have yet to prove their worth. Primitive systems can control patients between office visits to the doctors in virtual nursing.[19]

2.Applications of Artificial Intelligence in Health and Medicine

INTERNIST-I, CASNET, and MYCIN expert systems are the first artificial intelligence applications used in health to benefit doctors and patients. [20] INTERNIST-I was an expert system designed in the early 1970s to diagnose multiple diseases in internal medicine by modeling the behavior of clinicians.[21] CASNET (Causal Associational NET works), developed in the 1960s, was a general tool for building expert systems to diagnose and treat diseases. The most significant Expert System application based on CASNET was CASNET/Glaucoma to diagnose and treat glaucoma.[20] MYCIN is a computer-based consultation system designed to assist physicians in analyzing and therapy selection for patients with bacterial infections.[22]Examples of medical expert systems and decision support systems are shown in Table 1. [23]

2.1.Augmented Reality (AR) and Virtual Reality (VR)

AR and VR can be incorporated into every stage in healthcare system. These systems can be applied early in education for medical students, those training a particular specialty, and experienced surgeons. [24]Medical students can be presented and taught new and complex surgical procedures or learn about anatomy with AR technology without the need to engage or interact with real patients at an early stage or perform an autopsy on a real corpse. [24]

2.2.Natural Language Processing (NLP)

In healthcare, the dominant applications of NLP involve the creation, understanding, and classification of the clinical documentation and published research. NLP systems can analyze unstructured clinical notes on patients, prepare reports, transcribe patient interactions and conduct be conversational AI. [25]

2.3.Artificial Intelligence Powered Chatbots

Because doctors are very busy, patients who require a constant attention can become a problem. Artificial intelligence provides continuous support to these patients. Medication tracking, reminders of exercises and control of the required vaccine will be provided by artificial intelligence systems.In this way, patients can be followed up, and notifications can be sent to patients.

2.4.Virtual Nursing Assistants

Virtual Nursing Assistants perform many tasks, from the chatting with patients to guiding them to the best care unit. These systems serve 24 hours a day and can examine patients and provide instant solutions. In this way, unnecessary hospital visits of patients are reduced, and more regular interactions occur between the patient and the doctor.

2.5.Robot-Assisted Surgery

While doctors can gather information from medical records before surgery, artificial intelligence-assisted robots help doctors analyze patients before surgery. In addition, they can develop more effective surgical methods by analyzing the historical data of the patients. As a result, the treatment time of the patients and the margin of error in the surgery are significantly reduced. In surgeries performed with robots, the patient recovers in a short time and is discharged from the hospital with zero errors.

2.6.Cyber Security

All patient-related data must be kept confidential and secure. AI and ML algorithms protect computer, server, mobile device, and patient data from malicious attacks.

2.7.Intelligent Ultra Realistic Dentistry Robot (Showa Hanako)

Showa Hanako is a patient robot developed by Tokyo's Showa University and robotics company Tmsuk. In addition, it is a robot that gives actual patient responses such as blinking, eyeball, tongue movements, unexpected head shaking when pain is felt, sneezing, coughing, hand movements, and changes in respiratory pattern. [26, 27] Thus, dental students gain clinical patient experience by experience working with an actual patient.

2.8.Cancer Detection and Treatment

Artificial intelligence is expected to detect lung, breast, and similar cancer types. In addition, the development of artificial intelligence technology will help the health sector diagnose nervous system tumors and distinguish benign lesions from malignant ones.

3.The Application Areas of AI

The application areas of AI in the health sector are pretty comprehensive. Medical decision making, early diagnosis and treatment, developmental disease detection, drug development, evaluation of radiology images, and medical training have become very easy with the help of AI technologies. Moreover, these technologies can detect breast cancer, brain tumor, lung cancer, and skin cancer early. In addition, artificial intelligence-supported robotic surgeries facilitate the work of doctors, and personalized treatment is also provided with robot technology.

- **Artificial intelligence in clinical decisions:** IBM Watson is one of the essential artificial intelligence health support systems that can help doctors make efficient decisions. This system allows doctors to review patients' EHRs and medical research publications and guidelines for further research.[28]
- **AI in EHR (Electronic Health Record):** AI technology can help healthcare providers collect, store, reformat, trace clinical data, and develop personalized assessments and plans. [29]
- **AI in diagnosis:** Diagnostic errors are a serious threat to healthcare quality and safety. AI technology has been utilized to improve the quality of medical diagnosis, especially in radiology. [28]
- **AI in personalized medicine:**Personalized medicine (precision medicine) is a new healthcare model in which the treatment and prevention of diseases are based on individuals' conditions, including genetic information, psychosocial characteristics, environment, and lifestyles. [28]
- **AI in medical robots:** Applications of medical artificial intelligence technology include assistive medical robots and devices. Robots can also be used as assistant surgeons in the surgical field. [28]
- **AI in health care system management:**Current health care systems focus on treatment-based care, which cannot provide appropriate low-cost interventions for healthy high-risk subjects.[28]

4.Fighting with Covid-19

In the current pandemic (Covid-19) process, many artificial intelligence applications are also used to detect and fight Covid-19. Deeplearning is a subset of ML in AI with networks capable of learning unsupervised from unstructured or unlabeled data. [30]

Salman et al.[30]designed a model based on deep CNN and developed it to identify whether the X-ray image has COVID-19 or it does not (Healthy). Hu et al. [31]developed a modified stacked auto-encoder to model the epidemics' transmission dynamics. Jin et al. [32] proposed an AI system for rapid COVID-19 detection and performed extensive statistical analysis of Computed Tomography (CT) of COVID-19 based on the AI system.The rapid development of automated diagnostic systems based on artificial intelligence and machine learning will contribute to increased diagnostic accuracy and speed and protect healthcare workers by reducing their contact with COVID-19 patients.[33]

5.Advantages and Disadvantages of Artificial Intelligence In The Health and Medicine Sector

The machines can be re-programmed to work for a long time without getting bored or tired. [34] The advantages of AI in the health and medicine sector are given below.

- **Robotic Surgery:**In the surgeries performed by robots, the patient suffers less pain and recovers quickly with zero errors.

Before the operation, the robot does personalized planning and applies a treatment method. The robot only intervenes in the damaged area, and since it does not harm healthy bones and soft tissues, patients heal more effectively and have less pain.

- **Reducing Workload:**In surgery, doctors may have to perform surgery in series. This process is very tiring for doctors and increases the possibility of making mistakes. In addition, very long operations are reduced to a shorter time with robots, and healthier results can be obtained. Thus, our doctors get tired less, and the margin of making mistakes is reduced. Artificial intelligence and robots provide a lot of support to doctors in operating rooms. These systems help doctors by analyzing patients before surgery. They can also develop more effective surgical methods by analyzing past data.
- **Fast Treatment and Recovery Process:**Complications in artificial intelligence-assisted surgeries are less, and the patient's hospitalization period is shortened with treatment. As a result, the patient recovers faster and is discharged.
- **Emergency Service:**It is a race against time in emergency services. For example, when an individual who has had a traffic accident comes to the emergency room, this person should be diagnosed correctly and an effective treatment should be applied. To achieve this, the patient's medical history must be examined with artificial intelligence. Artificial intelligence guides doctors by compiling and analyzing this data very quickly.
- **Drug Development:**Drug development is a time-consuming task. With machine learning, the majority of analytical processes are being done and tested more effectively. This reduces the duration of studies that may take many years.
- **Special Treatment Opportunity:**Artificial intelligence offers individual treatment, therapy, and medicine. Thus, it allows the patient to recover faster and live longer. Being able to analyze the patient's health history very quickly also prevents the wrong treatment. If there is a drug that needs to be used, it can save the patient's life in an emergency by detecting it immediately.
- **Support for Persons with Disabilities:** Technologies developed with artificial intelligence have made the lives of individuals with disabilities easier. Thus, disabled individuals can adapt to social life more easily. For example, wheel chairs with artificial intelligence have been developed, and walking devices have been developed that allow people with spinal cord paralysis to walk.
- **VR and AR Technology:**Artificial intelligence can display human anatomy and organs very comfortably with VR and AR technology. This provides great success in both treatments and health education.
- **Covid-19 Detection:**Artificial intelligence systems enable the Covid-19 positive case detection. Artificial intelligence algorithms have been developed that can diagnose coronavirus from lung tomography in a short time.
- **Reducing Dosage Errors:** An extra dose of the drug in the body can have terrible side effects. Artificial intelligence technology can adjust the amount that patients will receive most accurately.
- **Emotional Exhaustion-Physical Limitation:** AI has no physical limitation nor emotional exhaustion. [35]

The disadvantages of AI in the medicine and health area

are given below.

- **Data set Used:** If the data sets used for machine learning and artificial intelligence are faulty, correct training will not occur, resulting in erroneous results.
- **Loss of Jobs:** With the increase in the use of machines and robots in the sector, the need for health personnel will decrease, and the employment of health and medical personnel will decrease.
- **Lack of Human Touch-Empathy, Emotional Intelligence:** It contains uncertainty as many unanswered questions about its moral and ethical dimensions. [36]
- **Change can be challenging:** People may not trust robots because they are not very open to change.
- **Lacks creativity:** Artificial intelligence only imitates what it has learned and can infer from it. But it lacks human creativity.
- **High Cost:** Becaus every complex machines are created with artificial intelligence technologies, it requires excellent costs. Besides installation costs, repair and maintenance costs can also be very costly.
- **Programming Error:** If they are programmed incorrectly, they can have hazardous consequences for humans.
- **Population Growth and Natural Resources:** Extended human life due to machines will cause population density. This will increase the consumption of natural resources. That's why we have to protect our natural resources.

- **Negative Impact on Health:** As artificial intelligence increases competition among students, this situation will stress them. It will put pressure on them. In this case, it can negatively affect the mental health and psychology of students. In addition, technological products cause various health problems due to the radiation they emit. Health problems such as eye disorder, nerve compression, neck, waist, and wrist pain can also be seen in individuals who spend a lot of time with technology. [37]

6. Conclusions

As in every developing and changing field, artificial intelligence has shown many changes and developments in health and medicine. AI facilitates the diagnosis of the disease and guides doctors to treat the disease early in the treatment process before it progresses. Thus, the patient starts treatment earlier, and the probability of recovery of the patient increases. Since patients want to benefit from health services more efficiently, their desire to use AI and robots increases; new drug discoveries will occur due to the use of artificial intelligence in medicine and health. By looking at the diseases of people with studies on genes, it will be possible to prevent the conditions that will cause the infection to emerge. As a result, the disease can be prevented, and people will stay healthy for many years. The use of robots in health and medicine dramatically

Table 1. Examples of medical expert systems and decision support systems. [23]

Name	Year	Place	Description
AAPHELP	1972	Leeds University (West Yorkshire, England)	Supporting the diagnosis of acute abdominal pain.
INTERNIST I	1974	University of Pittsburgh (Pennsylvania, United States)	Recognizing the complex diagnosis problems in general internal medicine.
MYCIN	1976	Stanford University (California, United States)	Diagnosing and recommend treatment for infectious blood diseases.
EMYCIN	1980	Stanford University (California, United States)	EMYCIN-Expert system shell, employing MYCIN's control structures.
CASNET/ GLAUCOMA	1960s	Rutgers University (New Jersey, United States)	CASNET (Caussal Associational NETworks)-expert system building tool dedicated to diagnose and treat diseases; CASNET/Glaucoma-expert system based on CASNET for the glaucoma.
PIP	1970s	Massachusetts Institute of Technology in Cambridge (MIT) and Tuffs-New England Medical Center in Boston	PIP (Present Illness Program)-generating hypotheses based on gathered data from patients about the renal disease.
ABEL	Early 1980s	Laboratory for Computer Science, MIT	Causal reasoning, management of electrolyte and acid base derangements.
ONCOCIN	1981	Stanford University (California, United States)	Helping physicians in the treatment of cancer patients receiving chemotherapy.
DXPLAIN	1984	Laboratory for Computer Science, Harvard Medical School in Boston, Massachusetts General Hospital	DSS using clinical findings to perform a ranked list of diagnoses that might be explained.
QMR (Quick Medical Reference)	1980	University of Pittsburgh (Pennsylvania, United States) and First Databank in San Francisco (California, United States)	DSS with a knowledge base containing about 700 diseases.

contributes to reducing the treatment process and the effort of doctors. In addition, this situation will give a new perspective to the way of medical practice. Great strides have been made in health and medicine with the joint work of humans and machines. Healthier and longer lives for future generations will be possible with the development of artificial intelligence machines.

During the pandemic (Covid-19), artificial intelligence technology has provided doctors with the opportunity to work remotely to treat patients. Healthcare workers should have minimal contact with the patient. With artificial intelligence machines, health workers tried to protect their health. By looking at the patient data, doctors can apply medicine and treatment without ever contacting the patient. In addition, Covid-19 positive case detection can be made with artificial intelligence. Artificial intelligence robots and artificial intelligence technology are used quite frequently in the training of healthcare personnel. Robots that provide real patient experience and VR technology that shows human anatomy have made it easier for medical and health students to learn.

In this study, benefits of using AI in health and medicine have been researched and examined by its purpose and presented with its advantages and disadvantages traditionally. In addition, artificial intelligence usage areas and artificial intelligence applications were also reviewed and researched.

It can be said that the health systems of countries with developing technology and artificial intelligence systems are also excellent and developed. Healthy generations build a healthy society; healthy societies build a healthy future.

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References

1. 23 and me, August 20, (2021). "https://www.23andme.com/, (2021).
2. K.G. Nalbant "Importance and Applications of Artificial Intelligence in Health Science", Hamidiye International Student Congress 2021 (HISCON2021), 23th-26th July, İstanbul, Turkey, (2021).
3. F. Wang, A. Preininger, AI in health: state of the art, challenges, and future directions, Yearbook of medical informatics, 28(01) (2019) 016-026.
4. P. Hamet, J. Tremblay, Artificial intelligence in medicine, Metabolism, 69 (2017) S36-S40.
5. G. Cornet, Robot companions and ethics a pragmatic approach of ethical design, J Int Bioethique, 24(4) (2013) (179-80).
6. D. Khanna, Use of Artificial Intelligence in Healthcare and Medicine, International Journal Of Innovations in Engineering Research And Technology, (2018).
7. A. Farooq, S. Anwar, M. Awais, M. Alnowami, Artificial intelligence based smart diagnosis of Alzheimer's disease and mild cognitive impairment. In 2017 International Smart cities conference (ISC2), (2017) 1-4.
8. S. Divya, V. Indumathi, S. Ishwarya, M. Priyasankari, S.K. Devi, A self-diagnosis medical chat bot using artificial intelligence, Journal of Web Development and Web Designing, 3(1) (2018) 1-7.
9. S. Berrouiguet, M. Barrign L. Castroman, J.L. Courtet, P. Artés-Rodríguez, A. Baca-García, Combining mobile-health (mHealth) and artificial intelligence (AI) methods to avoid suicide attempts: the Smart crises study protocol, BMC psychiatry, 19(1) (2019) 1-9.
10. D.B. Raja, R. Mallol, C.Y. Ting, F. Kamaludin, R. Ahmad, S. Ismail, B.M. Sundram, Artificial intelligence model as predictor for dengue out breaks. Malaysian Journal of Public Health Medicine, 19(2) (2019) 103-108.
11. S. Reddy, S. Allan, S. Coghlan, P. Cooper, A governance model for the application of AI in healthcare, Journal of the American Medical Informatics Association, 27(3) (2020) 491-497.
12. S. Kumar, R.D. Raut, B.E. Narkhede, A proposed collaborative framework by using artificial intelligence-internet of things (AI-IoT) in COVID-19 pandemic situation for healthcare workers. International Journal of Healthcare Management, 13(4) (2020) 337-345.
13. K. Ćosić, S. Popović, M. Šarlija, I. Kesedžić, T. Jovanovic, Artificial intelligence in prediction of mental health disorders induced by the COVID-19 pandemic among healthcare workers. Croatian medical journal, 61(3) (2020).
14. P. Singh, R. Kaur, An integrated fog and Artificial Intelligence smart health framework to predict and prevent COVID-19. Global transitions, 2 (2020) 283-292.
15. S. Bekhet, M. Hassaballah, M.A. Kenk, M.A. Hameed, An artificial intelligence based technique for COVID-19 diagnosis from chest X-Ray. In 2020 2nd Novel Intelligent and Leading Emerging Sciences Conference (NILES), (2020) (191-195).
16. M. Kumar, L. Rana, Artificial Intelligence: A tool for COVID-19 surface detection. Artificial Intelligence, 6(7) (2020) 60-63.
17. A. Choudhury, S. Perumalla, Detecting breast cancer using artificial intelligence: Convolutional neural network. Technology and HealthCare, 29(1) (2021) 33-43.
18. R.F. Mansour, A. El Amraoui, I. Nouaouri, V.G. Diaz, D. Gupta, S. Kumar, Artificial Intelligence and Internet of Things Enabled Disease Diagnosis Model for Smart Healthcare Systems. IEEE Access, 9 (2021) 45137-45146.
19. E. Strickland, IBM Watson, heal thyself: How IBM over promised and under delivered on AI health care. IEEE Spectrum, 56(4) (2019) 24-31.
20. V.S. Jadhav, A. Sattikar, REVIEW of Application of Expert Systems in the Medicine. In Proc. National Conference on Innovations in IT and Management, (2014) 122-124.
21. D.A. Wolfram, An appraisal of INTERNIST-I, Artificial intelligence in medicine, 7(2) (1995) 93-116.
22. W. Van Melle, MYCIN: a knowledge-based consultation program for infectious disease diagnosis, International journal of man-machine studies, 10(3) (1978) 313-322.
23. M. Furmankiewicz, A. Sołtysik Piorunkiewicz, P. Ziuziański, Artificial intelligence systems for knowledge management in e-health: the study of intelligent software agents. In Latest trends on systems: The proceedings of 18th international conference on systems, Santorini Island, Greece, (2014) (551-556).
24. A. Bohr, K. Memarzadeh, The rise of artificial intelligence in healthcare applications, In Artificial Intelligence in healthcare, (2020) (25-60).
25. T.Davenport, R. Kalakota, The potential for artificial intelligence in healthcare. Future healthcare journal, 6(2)

(2019).

26. Showa University, August 15, (2021), "https://www.showa-u.ac.jp/", (2021).

27. Tmsuk Practical Robotic Solutions, August 25 (2021), "https://www.tmsuk.co.jp/en/", (2021).

28. J. Guo, B. Li, The application of medical artificial intelligence technology in rural areas of developing countries, Health equity, 2(1) (2018) 174-181.

29. R.O. Deliberato, L.A. Celi, D.J. Stone, Clinical note creation, binning, and artificial intelligence.,JMIR medical informatics, 5(3) (2017).

30. F.M. Salman, S.S. Abu Naser, E. Alajrami, B.S. Abu Nasser, B.A. Alashqar, Covid-19 detection using artificial intelligence, (2020).

31. Z. Hu, Q. Ge, S. Li, L. Jin, M. Xiong, Artificial intelligence forecasting of covid-19 in china, arXivpreprint arXiv:2002.07112, (2020).

32. S. Mohanty, M.H.A. Rashid, M. Mridul, C. Mohanty, S. Swayamsiddha, Application of Artificial Intelligence in COVID-19 drug repurposing. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, (2020).

33. A. Alimadadi, S. Aryal, I. Manandhar, P.B. Munroe, B. Joe, X. Cheng, Artificial intelligence and machine learning to fight COVID-19, (2020).

34. S. Bhbosale, V. Pujari, Z. Multani, Advantages And Disadvantages Of Artificial Intellegence, Aayushi International Interdisciplinary Research Journal, (2020) 227-230.

35. S. Oh, J.H. Kim, S.W. Choi, H. J. Lee, J. Hong, S. H. Kwon, Physician confidence in artificial intelligence: an online mobile survey. Journal of medical Internet research, 21(3\0 (2019).

36. P.M. Amisha, M. Pathania, V.K. Rathaur, Overview of artificial intelligence in medicine. Journal of family medicine and primary care, 8(7) (2019).

37. K.G. Nalbant, The Importance of Artificial Intelligence in Education: A short review, Journal of Review in science and engineering, (2021) 1-15.