



## REVIEW ARTICLE

Medicine Science 2019;8(3):770-3

# The use of artificial intelligence in different medical branches: An overview of the literature

Oytun Gunes<sup>1</sup>, Gulsen Gunes<sup>2</sup>, Duygu Celik Seyitoglu<sup>2</sup>

<sup>1</sup>Electrical and Electronics Engineering Bilkent University, Ankara, Turkey

<sup>2</sup>Inonu University Medical Faculty, Department of Public Health, Malatya, Turkey

Received 05 March 2019; Accepted 03 April 2019

Available online 10.05.2019 with doi:10.5455/medscience.2019.08.9036

Copyright © 2019 by authors and Medicine Science Publishing Inc.

### Abstract

The goal of this study is to help create a perspective about usage of Artificial Intelligence in some branches of medicine as oncology, radiology, surgery, emergency medicine, etc. A literature review of “Artificial Intelligence in medicine” and for the use of artificial intelligence in some medical branches has been done. Radiology is one of the most notable in the artificial intelligence field and open to many developments in this field. Ten millions of radiology reports and billions of images are now digitally accumulated, simplifying the “big data” concept and creating the bottom line for Artificial Intelligence research. Pathologists used Artificial Intelligence to reduce the error rate of diagnosis of cancer-positive lymph nodes. The accuracy of cancer prediction results has increased considerably in 15-20% of recent years with the application of Machine Learning techniques. Two deep learning systems trained to detect and treat diabetic retinopathy and macular edema achieved high specificities (98%) and sensitivity (87% - 90%) to detect moderate retinopathy and macular edema using a large of retinal photographs in ophthalmology. Several Machine Learning models have promised to develop current triage methods in the Emergency Departments. Surgeons will likely see the Artificial Intelligence analysis of the population and patient-specific data in the future. Artificial Intelligence can certainly help doctors make better clinical decisions and judgments in certain functional areas in health care..

**Keywords:** Artificial intelligence, medicine, machine learning, medical branches

### Introduction

The expression “artificial intelligence (AI)” had been first procreated at a famed Dartmouth College. The first work of the artificial medical intelligence until the 1970s, when the artificial intelligence area was about 15 years, medical researchers could see the pertinence of Artificial intelligence practices to life sciences in the dendral tests in the 1970s. There was a great interest in AI’s medical practices in the 1970s [1].

John McCarthy described the term “artificial intelligence” in 1955 as “intelligent machining and engineering.” It was very influential in AI’s early development. In the following years, computers began to solve many complex mathematical problems that occurred after the deceleration period of the ‘80s. This was a new golden era that was resumed with the use of data mining and medical diagnostics [2].

We will discuss here the use of AI in medicine (AIM) and health systems. This study aims to help procreate a perspective about Artificial Intelligence in some branches of medicine. A literature review of “AI in medicine” and for the use of artificial intelligence in some medical branches has been done.

### Artificial Intelligence in Medicine

In the 1970s, the AI research community was influenced and focused on the applications developed in the medical world. In 1978, the important magazine in the area dedicated a special topic to AI in Medicine study only. In the next ten years, the Society persisted in enlarging and, with the establishment of the American Society for Artificial Intelligence in the 1980s, a particular sub-group on medical practices was established [1].

There are two main branches of AI implementation: virtual and physical. Machine Learning indicates the actual fragment indicated by mathematical processes that develop learning through incidents. The virtual space includes knowledge-based information management approaches to examination health administration systems, including electronic health archives and active guiding in the therapy decisions of doctors. The physical branch is most presented by robots used to support elderly people or interested

\*Corresponding Author: Duygu Celik Seyitoglu, Inonu University Medical Faculty Department of Public Health, Malatya, Turkey  
E-mail: drduygucecik@hotmail.com

surgery branches [2].

Later, studies on image analysis (radiographic, histological), native speech operation, medicine efficiency style, and variation of gene mutation phrase were made. New AI applications have been developed so in the future AI has been proven to be very beneficial in the practice of general medicine [3].

#### **Artificial Intelligence in Pathology and Dermatology**

Histology and pathology of near 1500 skin samples were examined handling baseline pattern analysis of deep learning architecture to define basal cell cancer and distinguish malign lesions from benign lesions and performed better than previously automated analyzes and achieved a diagnostic accuracy of 90% compared to the specialists [3]. Deep learning histology and pathology recognize metastatic breast cancer in sentry lymph node biopsies with diagnostic correctness for neoplasm finding and limitation parallel to those of experts[4]. These systems train millions of tumor-positive and -negative histological preparations by comparing them with handling heat scheme to estimate tumor possibilities. These systems reduce the human error rate by 85% by combining pathologists and deep learning optimization.

Convolutional neural networks did better dermatologists at keratinocyte carcinoma and melanoma discovery by grading about 130000 images of about 2000 malignant and benign skin lesions utilization a lot layered algorithms trained to define widespread fatal skin cancers [5]. Pathologists used AI to reduce the error rate of diagnosis of cancer-positive lymph nodes from 3.4% to 0.5% [6].

#### **Artificial Intelligence in Diabetes**

For people with diabetes, retinopathy is one of the worst complications. Two deep learning systems trained to define and treat diabetic retinopathy and macular defect reached high specificities and sensitivity to detect moderate retinopathy and macular edema using 128.000 retinal photographs from 5871 subjects compared with 54 experts in ophthalmology [7]. The applicability of this touche and its strength to develop diabetes care and results suppose validation [3].

One of the most important causes of blindness in the world is diabetic retinopathy. In the United States, the incidence of diabetes is about 9%, about 29 million people. It is estimated that this figure will rise to 44 billion by 2030.

A retrospective cohort study was conducted in approximately 15,000 patients with type 1 or type 2 diabetes. Retinal scanning and fundus photographs were performed on these patients with a system called Intelligent Retinal Imaging System (IRIS). IRIS was a computer algorithm-based screening program. The images printed by the IRIS program were compared with the manual examination. IRIS algorithm population statistics are calculated. The sensitivity of the IRIS program was high. The false negative rate was also low. It was thought that this developed IRIS program could then be an alternative to conventional examinations. [8].

#### **Artificial Intelligence in Heart Diseases**

VI. Congestive heart failure (CHF) is the inability to pump enough blood to meet the needs of the heart's body. CHF is one of the main causes of illness and disability in the United States

and is one of the main causes of hospitalization of people over 65. The first was the 1990s that neural networks had been used for electrocardiograms to identify myocardial infarction and the duration of hospitalization after a surgical operation was used to estimate. Heart failure with a protected ejection fraction (HFpEF) is an effective condition for low genetic factors. Machine learning that has been clinically trained in HFPEF patients has been trained, and sets of phenotypic heat maps have been created to allow risk assessment. Artificial intelligence approaches can define HFPEF sub-clusters or individuals who may demonstrate efficacy from therapies without survival benefits [3].

#### **Artificial Intelligence in Stroke**

Stroke is a chronic disease that has an important place among the causes of death. It occurs when the blood supply is blocked. A stroke is a medical emergency that requires emergency medical attention. Control and decision making in the clinic is a difficult and complex situation. In this mixed situation, artificial intelligence can be used in the field of neurology. Usually, Clinical Clinical trials are designed to resolve these mixed situations [9]. It is expected that AI will help in more complex studies and then closer to real life clinical trials. In recent times, researchers have begun to work in this direction and have achieved promising outcomes [10].

#### **Artificial Intelligence in Radiology**

Radiology is a medical specialty that is faced with very rapid technological changes. Radiologists have to adapt to this rapid change. Radiologists have benefited from digital systems while reading graphs, but there are worrying about machines that take people since human beings to consider the possible, even likely, cultural disability of adopting AI in radiology [11].

Obermeyer and Emanuel [12], who wrote in the New England Journal of Medicine, machine learning will soon take the place of radiologists and pathologists, perhaps learning machine learning more accurately than people diagnose it [11].

Radiology has played a pioneering role in medicine's digital era and now plays a pioneering role in the use of AI in medical practice. Millions of radiology reports and billions of images of graphics are now digitally accumulated, simplifying the "big data" concept and creating the bottom line for AI research [10]. "Big data": The more known data, the more accurate the estimate of unknown data. Big data is important for this [13].

Radiological images from some national and international centers can be collected through a sharing network in the research to be carried out in this regard. Reference data sets can be generated. Protocols can be set up for diagnosis. These protocols should also be standardized. So if accuracy is high, AI accuracy will be high. Trained researchers in radiology AI methods are limited. Professional radiology communities can work with scientists with AI education in radiology. Radiology is one of the most notable in the artificial intelligence field and open to many developments in this field [10].

#### **Artificial Intelligence in Surgery**

Surgeons have an important role in the adoption of AI-based technologies in surgical branches. They should be willing to cooperate with data scientists to use a new data form and to help interpret the data in a meaningful way [6]. Surgeons will likely see

the AI analysis of the population and patient-specific data in the future. For example, a patient undergoing evaluation for bariatric surgery will follow weight, glucose, food, and activity through mobile applications and fitness followers.

Automatic analysis of all mobile and clinical data before surgery may provide a patient-specific risk score for operation planning and lead to valuable predictors for postoperative care. Integration of pre-, intra-, and postoperative data may help to monitor recovery and to predict complications. After becoming a discharge, post-operative data from personal devices may continue to integrate into the patient's intake of doses to maximize the resolution of weight loss and obesity-related comorbidities.

If properly developed and applied, artificial intelligence has the potential to be taught by the surgeon and applied with the promise of a future for patient care at the highest quality [6].

### **Artificial Intelligence in Oncology**

Cancer is an important chronic disease of many different subtypes that can lead to mortality. Early diagnosis in cancer is very important. Early diagnosis has a great influence on the life span. Early diagnosis in cancer is very important. When you are diagnosed early, life is more likely. Therefore, scientists interested in cancer are trying to develop new screening methods for the early diagnosis of cancer. Cancer data can also be collected from many centers and shared on a shared network to create a large data set. Thus, new technologies, big data and artificial intelligence can also be used for cancer.

The correct diagnosis in cancer is an important task that doctors often want. The methods of learning the machine have recently attracted the interest of researchers in the correct setting. While these methods can accurately predict the future outcome of cancer illness, they can identify and define patterns and relationships between complex data clusters [14].

It is excise that the implementation of Machine Learning methods may increase the correctness of cancer sensitivity, repetition and survival forecast. The correctness of cancer prediction results has increased considerably in 15-20% of recent years with the implementation of Machine Learning methods.

There are two common types of ML methods known as (i) supervised learning and (ii) unsupervised learning. In supervised learning, a set of labeled training data is used to calculate the input data according to the desired output. However, under uncontrolled learning methods, labeled samples are not given, and there is no idea about the output during the learning process. The main purpose of ML techniques is to produce a model that can be used to perform classification, forecasting, estimating or similar tasks. The most common task in the learning process is a classification

Machine learning has different methods. There are two important methods of machine learning, supervised learning and unsupervised learning. The labeled training is used for supervised learning, and the input data can be used according to the desired result. There are no labeled events in the methods without supervision, and there is no prediction about the result during the learning process. The most important task in machine learning is classification. ML techniques aim to produce a model for predicting, classifying and

performing similar tasks [14].

### **Artificial Intelligence in Neurosurgery**

Sendler et al. examined twenty-three studies using ML algorithms for diagnosis, pre-surgical organizing, or result estimation in neurosurgical patients. In comparison with clinical specialists, 50 outcome measures of a value of P resulted in 29 (58%) ML models performing better than the clinical specialists. ( $P < .05$ ). There was no difference between ML and expert capacity in 18 of 50 (36%) patients ( $P > .05$ ), and 50 (6%) of the clinical specialists had higher performance than ML models in 3 ( $P < .05$ ). All four studies using ML models supported clinicians and clinicians alone performed better in the first group.

Artificial intelligence shows that clinicians have the possible to increase decider capacity in neurosurgical diagnosis, preoperative planning, and result estimation; however, It is also an important issue that obstacles for acceptance and establishment of machine learning techniques in clinical settings are raised [15].

### **Artificial Intelligence in Emergency Medicine**

In hospitals emergency departments (ED), classifying patients, predicting outcomes and quickly interpreting clinical findings are important both for the patient and for cost and efficiency. For this reason, it is necessary to use artificial intelligence in the emergency department.

In emergency departments, first triage, risk classification and rapid evaluation of the patient are required. Particularly, these steps need to be completed completely in crowded EDs. Several ML models have promised to develop current triage methods. ML models have been developed to predict situations such as hospital infection. Emergency physicians are responsible for recognizing life-threatening conditions as soon as possible. For example, in a patient with chest pain, cardiac complications are vital if they have an acute condition. It is vital that they recognize it as soon as possible. In the emergency department, there is artificial intelligence work in the field of radiology to make a quick diagnosis. Various algorithms have been developed for this purpose. Several algorithms have been developed for non-contiguous computerized tomography in areas such as bleeding, a mass, an acute infarct, trauma-related brain injury, or brain hemorrhage. Many of these algorithms have a high probability of 95-100%, such as 95% to 99% [16].

### **Conclusions**

Artificial intelligence has begun to be used in many fields of medicine. It has been used in many systems ranging from databases to video analysis. This is in turn related to the increased awareness of physicians about the capacity of technology. Physicians will also be problematic in making decisions [17]. But with the help of technology, things will become easier, and productivity will increase).

This is especially true in medical and health services; there are a lot of data available from the medical archive and also from the report ensured by wearable health detectors. This a lot of data should be examined in detail to make the information not only about individuals who want to make advanced about physical exercise

but also about the development of health care design based on the requirements and characterizations of the sickness [2].

We are entering a new era of oncology, and our current generation of physicians should be prepared to approach this profession with such curiosity in this profession [17]. We do not think physicians will be replaced by machines, of course, but we believe that artificial intelligence will help physicians decide more in the future, in diagnosing, especially in areas such as radiology and pathology. The increase in healthcare services and the quick progress of big data analytical methods have made it feasible for AI to be successful in health care services [9].

#### Competing interests

*The author confirms that this article content has no conflict of interest.*

#### Financial Disclosure

*All authors declare no financial support.*

#### Ethical approval

*As it is a compilation study, we do not have an ethics committee approval.*

*Oytun Gunes ORCID:0000-0001-8845-7862*

*Gulsen Gunes ORCID:0000-0003-2021-7103*

*Duygu Celik Seyitoglu ORCID:0000-0003-1603-8532*

#### References

1. Patel VT, Shortliffe EH, Stefanelli M, et al. The coming of age of artificial intelligence in medicine. *Artif Intell Med.* 2009;46:5-17.
2. Hamet P, Tremblay J. Artificial intelligence in medicine. *Metabolism.* 2017;247:36-40.
3. Miller DD, Brown EW. Artificial intelligence in medical practice: the question to the answer? *Am J Med.* 2018;131:129-33.
4. Wang D, Khosla A, Gargeya R, et al. Deep learning for identifying breast cancer. In: *Proceedings of the International Society on Biomedical Imaging (ISBI). Quantitative Methods*, 2016.
5. Esteva A, Kuppel B, Novoa RN, et al. Dermatologist-level classification of skin cancer with deep neural networks. *Nature.* 2017;542:115-9.
6. Hashimoto DA, Rosman G, Rus D, et al. Artificial intelligence in surgery: promises and perils. *Ann Surg.* 2018;268:70-6.
7. Gulshan V, Peng L, Coram M, et al. Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs. *JAMA.* 2016;316:2402-10.
8. Walton OB, Garoon RB, Weng CY, et al. Evaluation of automated teleretinal screening program for diabetic retinopathy. *JAMA Ophthalmol.* 2016;134:204-9.
9. Jiang F, Jiang Y, Zhi H, et al. Artificial intelligence in healthcare: past, present, and future. *Stroke Vascul Neurol.* 2017;2:230-43.
10. Ye H, Shen H, Dong Y, et al. Using evidence-based medicine through advanced data analytics to work toward a national standard for hospital-based acute ischemic stroke treatment. *Mainland China*, 2017.
11. Thrall JH, Li X, Li Q, et al. Artificial intelligence and machine learning in radiology: opportunities, challenges, pitfalls, and criteria for success. *J Am Coll Radiol.* 2018;15:504-8.
12. Obermeyer Z, Emanuel EJ. Predicting the future—big data, machine learning, and clinical medicine. *N Engl J Med.* 2016;375:1216-9.
13. Bini SA. Artificial intelligence, machine learning, deep learning, and cognitive computing: what do these terms mean and how will they impact health care. *J Arthroplasty.* 2018;33:2358-61.
14. Kourou K, Exarchos TP, Exarchos KP, et al. Machine learning applications in cancer prognosis and prediction. *Comput Struct Biotechnol J.* 2014;13:8-17.
15. Senders JT, Arnaout O, Karhade AV, et al. Natural and artificial intelligence in neurosurgery: a systemic review. *Neurosurgery.* 2017;83:181-92.
16. Berlyand Y, Raja AS, Dorner SC, et al. How artificial intelligence could transform emergency department operations. *Am J Emerg Med.* 2018;36:1515-7.
17. Alessandra CF. A new era of oncology through artificial intelligence. *ESMO Open.* 2017;2:1-2.