

Uses of Machine Learning in Healthcare Sectors

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Abstract

When it comes to human health and life, any technology that can provide a more efficient, useful and faster analysis to deliver an appropriate treatment plan on time is of immense value. Artificial intelligence and its division M.L. It is taking over the world now every day little by little business use cases are appearing in technologies news. Industry is same with administration or financial fields seek to be the best choices for technology, but other sectors Are the healthcare industry any different or same? Be sure not. Speaking of AI in the field of medicine, we must realize the huge potential and changes that M.L can contribute to the healthcare industry.

M.L. for healthcare technologies provides algorithms with self-learning neural networks that can increase the quality of treatment by analyzing external data on a patient's condition, their X-rays, CT scans, various tests, and screenings. Also, worth mentioning, deep learning is now primarily used for detecting cancer cells.

In this paper we attempt to explain how ML can transform management and both patient care methods in the technology and industry. We have papers and researches to prove M.L. often outperforms humans at diagnosing the disease. Algorithms are doing a good and high jump of detecting malignancies compare with actual radiologists. M.L. for medical technology companies offers algorithms with convolution learning neural networks or other types of algorithms that can increase the quality of treatment by analyzing external data about a patient's status, it is noteworthy that deep learning is now mainly used to detect cancer

cells. Also CT scans, x-rays, and various medical tests and examinations or screenings.

However, there is high distance from complete replace humans by smart devices or robotic in all Medicine fields. This research is focused about advance uses of A.I. in medical and healthcare sectors and the drawbacks or limitations for broader uses.

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1. Introduction

Since 1890 the early days of X-ray imaging to the most recent advancements in M.R.I., CT, and P.E.T. Scanning, medical scans remains the mainstay of medical therapy or treatments. Now day's advances in scanning devices in terms of characteristics, resolution, and sensitivity make it possible to distinguish subtle differences in tissue density. These differences are difficult to recognize in some cases by a training eye and even by some artificial intelligence. Methods used in the clinic. Therefore, these methods are not on par with the sophistication of imaging tools.[11]

For example, a nurse in the USA spend 25 percent of her work time to organizational and administrative activities. Technology can be handle routine claims processing easily, clinical records, revenue cycle management, and document management.

M.L., It is one of the most common subdivisions of AI., because It is intended to "train" models with practical data. According to study in Deloitte survey of 1,100 United State companies that used artificial intelligence, 63 percent of them focused on M.L., It is a widespread technology that have use in many industries and cases.

Another example about Harvard Business Review survey, more than 300 healthcare executives and clinical managers said there was a problem with patient engagement. More than 70 percent of those surveyed reported that less than half of their patients were highly involved in the treatment process, while 42 percent said that less than a quarter of their patients were highly involved. In Iraq, we can benefit from these studies and apply them on the ground, whether in government or private hospitals, on how to use them for this aspect, patient participation leads to better health outcomes

for patients. For example, patient can send automated message alerts and specific relevant content that triggers actions at key moments, generally, there are a multi ways that ML can personalize and enhance the response process. [2]

These algorithms are designed to learn from data by independent approach without human intervention. Little by little the M.L. algorithm can improve prediction accuracy without needed of programming. Full immersion in ML reveals the three basic components of an algorithm: representation, manipulating and get finally optimization. It means that data must be classified in a form and language that can be processed by a computer. This component lays the foundation for the next component (evaluation) to determine whether the data label (classification) is useful as part of the optimization process, the algorithm finds the Optimal model for the most effective and accurate results.[5]

Every time M.L. receives data, the algorithm changes the model and finds a new pattern. This method supports learning and provides increasingly accurate output.

The algorithm starts from this learning process without programming. ML can be supervised, unsupervised, semi-supervised or reinforced.

Supervised learning: According to Gartner, in 2022, *supervised learning* (a type of machine learning that feeds historical and classified input and output data into algorithms) will continue to be the most commonly used machine learning techniques.

Unsupervised learning: the algorithm can independently determine the patterns of data without prior classification. It has several applications. Example given in the industry sectors, they can use predictive maintenance to locate plant systems before they fail. [1]

Semi-supervised learning: it is somewhere between supervised and unsupervised, Semi-supervised learning algorithms can mix categorized data and uncategorized data to diagnose and build a model to solve the problem, the latest studies showed the promise of *semi-supervised* learning models in accelerating therapy or drug finding.

Reinforced learning: it teaches algorithms through a reward system. Algorithms produce multiple results and choose the correct result; they are rewarded for desired behaviors and punished for unwanted behaviors. According to a recent study, varies of applications, contenting autonomous robotic nanofabrication, can use *reinforcement learning*. [9]

2. The Precise Applications for M.L. and AI in Healthcare and Medicine sectors. [3]

An artificial intelligence if the patient needed to real-time advice, the assistant is very convenient and it may be difficult for them to find a physician; data analytics are developing solutions for all medical needs that involve overall health screening or monitoring and help cure and even prevent diseases.

In other places, for the widespread use of chatbots, you should pay close attention to the implementation of the M.L.in Healthcare algorithm in oncology, pathology, and rare diseases.

Therefore, the M.L.in Healthcare algorithm is mainly an artificial neural network. Example given, Convolutional Neural Network (CNN) performs image recognition, detection, and identification. This is a complex artificial neuron layer system that is connected to each other and previous trained on the damaged cell image data set to "remember" the appearance of damaging cells.

It enables the creation of neural networks and the detection of cells damaging the organism (like cancer cells).

It is able to create neural networks and detect cells that destroy organisms (such as malignant cells).

The healthcare technology in M.L.in oncology searches for cells affected by cancer with an accuracy comparable to that of experienced doctors. The work of pathologists when examining patients' organic fluids (like tissues, blood, and urine) can be analyzed better and faster with the help of machine learning capabilities. In addition, we must admit that we still lack information about the origin of rare diseases and the connection to the specific characteristics of patients with these diseases.

Google has launched an algorithm that can successfully diagnoses cancer in mammograms, and Stanford University scientists can identify skin cancer through deep learning. Artificial intelligence is responsible for processing thousands of different data points, accurately predicting risks and outcomes, and many other purposes.

3. Top 12 Artificial Intelligence Innovations Disrupting Healthcare by 2020 [4]

Diagnosis and disease identification.

ML is very good in identification and diagnosis; in fact, this is one of the most effective areas. There are many types of cancers and genetic diseases that are difficult to detect, ML can deal with many of these problems in the early stages. IBM Watson Genomics is a good example. The project mixed genome-based tumor sequencing with cognitive computing to provide help for rapid diagnosis. P1vital's PReDicT(predict of response to depression drug) is trying to create a practical method through artificial intelligence to improve the level of identification, diagnosis and treatment in specific hospitals.

The prediction of diabetes.

Diabetes is the one of the most common and pernicious disease, it not only harm a person's health, but also causes othermany serious diseases, Diabetes mainly caused to kidney failure, heart and nerves. ML can help identifies diabetes early and save live,categorizedof algorithms such as decision trees, K.N.N., and Naive Bayes can be used as the basis for constructing predictive diabetes systems. In terms of performance and computing time, Naive Bayes is the most effective.

Health records improvement.

With all these technology advancements, savinghealthy records is still a hassle, today, it is much faster, but it still occupied a long time. Records, files and documents can be ML based on vector machines and O.C.R. Identification technology. The best examples are Google's Cloud Vision API and MathWorks ML handwriting recognition technology.

They are predicting liver disease.

The liver functionplays in metabolism. It is prone to infections such as chronic hepatitis, liver cancer and cirrhosis. Using massive medical data to effectively predict liver disease is a difficult task; however, significant changes have taken place in this area. Algorithms such as ML classification and clustering play a role here. The Liver Disease Dataset or the Indian Liver Patient Dataset (ILPD) can be used for this function.

Finding best cure.

Great use of M.L. in which the first level of patient drug discovery, in these days Microsoft uses artificial intelligencebased technology in its Hannover project, which aims to find a drug combination designed to treat acute myeloid leukemia.

They are making diagnoses via image analysis.

Microsoft was revolutionizedmedical data analysis with Project InnerEye. This startup uses computer vision to process medical images for diagnosis. With the development of technology, InnerEye is making waves in the field of medical analysis software.

Insides Radiology is located at the intersection of radiology and multiple oncology sub-specialties. and so on, creating these text reports can be a arduous and time-consuming daily functions. [11]

Personalizing treatment.

MLin the fields of Medicine is attempting to make significant progress. I.B.M. Watson Oncology is a leader in this field, and it provides many treatment plans that first analyze the patient's medical history. As advanced biosensors enter the mass market and provide more data for algorithms, things will get better when making personalized drug response planning.

Adjusting behavior.

a very interesting field of observation. Does it provide tips for preventing cancer in your daily activities? This is exactly what the B2B2C-based company Somatix's application is doing. This application tracks unconscious activities daily and reminds us of those activities that may be danger in the long run.

Medical research and clinical trial improvement.

Now days, researchers have access to large amounts of data published by the patients themselves. This is the source of ML improvements in future medicine,andthe data analysis is important in healthcare studies, the collaboration between Medtronic and IBM has achieved the ability to decode, aggregate and provide insulin information in real time. With the development of the Internet of Things (IoT), there will be more possibilities. In addition, public data will improve the diagnosis and prescription process.

The clinical trials may take years to complete and require substantial investment. ML can provide predictive analysis to find the optimal candidates for clinical trials depend upon variables such as personal medical history or social media activities. The technology will reduce the number of data based errors and recommend the best sample size for testing.

Epidemic control.

Talking about data analysis, experts have access to satellite, social media trends, news in 2020, neural network can handle all these things, see and the threat of pandemic is serious around the world. A good example might be Promed-Mail, an Internet-based reporting platform used to monitor global pandemic reports.

A.I. Surgery.

Perhaps the most influential area of machine learning, see and it will disappear more and more in the near future. You can divide robotic surgery into the following categories: self-suturing, surgical letters

Surgical skill evaluation.

The main meaning of stitching is to stitch up an open wound. Automating this process makes the entire procedure shorter while reducing the pressure on the surgeon. Take a look at the Raven surgical robot in action, Even though it is too early to talk about processes and surgeries that are performed entirely by smart devises or robotic, they can now aid and help a doctor who manipulates surgical instruments. In the next five years, it is expected to become a specialized industry with a capital of about \$39 billion. When a medical procedure is performed, the robot will bring the equipment to the doctor with its robotic hands. This type of practice reduces surgical complications by up to 50 percent and in the patient's operating room by about 20 percent, ML Algorithms for Healthcare Data Analytics also assesses and defines new opportunities for future surgeries, as it gathered data on each AI Surgery.

4. The most critical challenges for A.I. in Healthcare [6].

The most popular challenges about A.I. in healthcare sectors can be explained in the table below.

Table 1. Represent the biggest challenges for A.I. in Healthcare [6]

Areas	Challenges
Data governance	Medical data remains personal and is prohibited for use. However, according to a UK Wellcome survey, only 17 per cent of general respondents are against sharing their medical information with third parties.
Transparent algorithms	The need for transparent algorithms is not only necessary to meet strict drug development regulations, but, in general, also requires that people understand how algorithms actually generate conclusions.
Optimizing electronic records	There is still a lot of fragmented information between the different databases that needs to be further organized. When this condition improves, it will lead to progress in personalized treatment solutions.
Embracing the power of data silos	medical industry must change its view of the value of data and how it can provide value from a long-term perspective. Pharmaceutical companies, for example, are usually reticent to change their product and research strategies in the absence of immediate financial gain.
Data science experts	Attracting more specialist ML and data science experts is important for both the health and pharmaceutical industries.

5. The Impacts of M.L.in Health Informatics Healthcare. [7],[8]

The sections in below will explained three components of machine learning in health informatics affects healthcare.

Recordkeeping

M.L.in Health Informatics can simplify record keeping including Electronic Health Records (E.H.R.s). Using artificial intelligence to improve EHR organizational can improve health of the patient, reduce healthcare and management costs, and best operations.

Data Integrity

The high gap in health information leads to inaccurate predictions made by the M.L. algorithm, which has a negative impact on decision-making in the clinical environment.

Predictive Analytics

Combination of the three components machine learning, predictive analytics and medical informatics provides opportunities to improve health care processes, transform clinical decision support tools, and help improve patient outcomes. The potential of machine learning to transform health care lies in its ability to use health informatics to predict health outcomes through predictive analysis, leading to more accurate diagnosis and treatment, and to help doctors in individual and group treatment. Insight improves.

6. Examining the Ethics of A.I. in Healthcare

To improve the efficiency of health care and patient care services, ML provides ethical issues.

Best medical information can play an important role in meeting the challenges of artificial intelligence. and the ethics of artificial intelligence in health care, including the following parts.

Sharing Patient Information

Worry about patient privacy, federal laws prohibiting the release of medical information, and informed consent are all related to sharing patient information.

The principle of efficient ML is practical data. Nonetheless, privacy and confidentiality laws are in place to protect patient information from vulnerabilities such as data leaks. The law prohibits doctors from sharing patient information except for medical reasons, such as when doctors share medical data about patients with oncologists or malignant experts to improve medical results.

Patient Autonomy

The issue of patient autonomy also exists. Many elderly and mentally ill patients cannot make health care decisions independently, Machine learning E.H.R. to help make important decisions in these situations, and may use data from other medical sources.

Patient Safety and Outcomes

In machine learning, the quality of data input determines the reliability of algorithm output. Incorrect or erroneous data will destroy the reliability of the system, causing the question of whether the data-based decision is correct.

Another concern about flawed data is that it may lead to a lack of cultural competence. For example, because data usually represents a minority group, it may put people at risk of overdiagnosis or underdiagnosis.

7. The future of A.I. in Healthcare.[8]

It is expected that AI will create more jobs in 2020 than will be eliminated due to automation. In addition, it is estimated that AI will create 2 million additional jobs by 2025. This is because AI and machine learning will only automate everyday tasks, some of which are far beyond human capabilities.

According to data from Allied Market Research, the global AI healthcare market will reach USD 22.8 billion by 2023. We discuss the annual savings of US\$150 billion in the healthcare industry thanks to artificial intelligence. and ml solution.

ML's deep learning algorithms can reduce the time required to view patient and medical data, thereby speeding up diagnosis and speeding up patient recovery.

ML has proved to be very helpful in the current global pandemic. As Health IT Analysis reports, it is a deep learning tool that can predict the growth of COVID-19 in counties in the United States with an accuracy of about 65%.

Various technology driven health care concepts are expected to improve health services in the next few years. These innovations will also transform the role of health informatics professionals, The following are examples of technologies that will impact healthcare in the coming years.

Virtual Reality

When we talking about virtual reality itmean's transforming healthcare by changing the lives of patients and making it easier for doctors to receive training.

Example given, special VR headsets can stream surgeries and provide medical students with a unique view of surgeries. In another example, V.R. is used in physical therapy to help speed recovery.

Patients receiving physical therapy often face strenuous physical activity that may feel burdened. We are. Through machine learning training exercises, recovery plans can be personalized and make physical therapy activities more enjoyable and attractive.

Genome Sequencing

Genomic data can assistphysicians to develop personal treatment planning for patients. M.L.in medical data can rapidly analyze gene mutations and help diagnose conditions that can lead to disease. Genome sequencing, through the application of ML, could impact the diagnosis and treatment of cancer and reduce the impact of infectious diseases.

The cost of the first human genome sequencing project was over US\$3 billion. According to the World Economic Forum, it took more than 13 years to complete, now dayscitizens can sequence their genomes and get results within a week for less than \$600. As genome sequencing becomes more affordable and ML gets better, health informatics professionals can help advance genomic medicine to treat the world's deadliest diseases.

Wearable Tech

From step counting to heart rate monitoring, information provided by various consumer wearable technologies can help people become healthier.

Other wearable technologies can provide doctors with important information about patient health, including heart rhythm, blood pressure, body temperature, and heart rate.

According to the Pew Research Center, approximately 21% of Americans use wearable technologies such as health trackers and smart watches. As more people adopt wearable technology,

health informatics experts can help improve the communication and accuracy of data shared between these devices and the health information systems used by doctors.

Augmented Reality

According to The Medical Futurist, Augmented Reality (AR) is one of three major technologies transforming health care. Similar to VR, AR applications in the healthcare sector can help medical students prepare better. AR technology can provide students with the opportunity to learn directly from surgeons performing actual surgery.

Nanotechnology

From the National Nanotechnology Initiative we can defined nanotechnology as “understanding and controlling matter between approximately 1 and 100 nanometers on the nanoscale”.

The application of nanotechnology in healthcare is called nanomedicine. Nanotechnology can help perform functions such as drug delivery including molecules, cell structures, and DNA working.

By other meaning, it is possible to bypass areas of the body system that are not affected by the disease to deliver drugs to the target area.

3D Printing

The Journal of Polymers and the Environment published 3D printing in biomedicine offers opportunities for the health sector. The 3D printing manipulation allows for effective manufacturing of drug manufacturing, implants, prostheses, biosensor devices and even human tissues and organs. This creates opportunity for personalized medicine, improves medical quality, lowers costs and minimizes product risk.

8. CONCLUSIONS

The three main components of machine learning, health informatics and predictive analytics provided good chances to improve medical operations in Iraq, both in the public and private health sector, medical diagnosis decision offer and support techniques to help and improve patient status. The potential for machine learning to transform healthcare lies in its ability to use health informatics to expect medical results through sequential medical analysis, to achieve more accurate

and sensitive diagnosis and treatment, as well as clinician insights into individual and group therapy.

M.L. can also offer and support others values from suitable medical analysis by converting data for optimal decision making to find process gaps and improve the trend of healthcare processes.

9. RECOMMENDATIONS

We recommend to gradually expand the use of artificial intelligence in Iraq especially that Iraq is suffering significantly from a collapse in the health sector, because ML is a strong health data to sorting and organization capabilities are the highest scores, as well as to accelerate clinicians' clinical decision-making and what predictions can save lives or make surgery less complicated, human lives are undoubtedly the most valuable things. Currently, the technology provided by machine learning in healthcare directly contributes to the future of advanced medical diagnosis and medicine. There are other solutions, such as deep learning that may be discussing it in future works.

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الخلاصة: عندتناول حياة الإنسان وصحته، فإننا نحاول أن نتمكن من تحليل أكثر فاعلية ومفيدة وأقل وقتاً لتوزيع عيطة علاج مناسبة في الوقت المناسب يمكن أن تكون ذات قيمة عالية، الذكاء الاصطناعي يوفر عاتقاً يسيطر على العالم في عصرنا الحالي، حيث أن فيكيو منظر المزيديو المزيدينا لاستعمالات الجديدة والناجحة في أخبار العلوم والتكنولوجيا مثل التمويل المصارفها فضلاً عن الخيار التكنولوجي، لكن القاطعاً الآخر كقطاع الرعاية الصحية ليست مختلفة عن هذه القطاعات التي ذكرناها بالحدوث في استعمال الذكاء الاصطناعي في المجال الطبي، يجب أن ندر كلاً إمكانات الهائل والتغيرات التي من الممكن أن تجلبها إلى قطاع الرعاية الصحية.

في هذا البحث نحاول أن نسلط الضوء على كيفية عمل الذكاء الاصطناعي من تطوير كل من الرعاية الصحية للمرضى والطرق الإدارية المرتبطة بها وإمكانية تطبيقها في المستشفيات الحكومية أو الأهلية في العراق لدى يعانيه من تأخر ملحوظ في هذا الجانب، حيث أثبتت بعض الأبحاث أن الذكاء الاصطناعي يكثر من الأحيان في تقويع لنا البشر في تشخيص المرضى، من خلال

ان الخوارزميات تعمل أفضل في اكتشاف الأورام الخبيثة من الأطباء المختصين، ان
لتكنولوجيا الرعاية الصحية إمكانات هائلة في معالجة الأمراض، أو الأشعة السينية، أو الأشعة المقطعية، با
لإضافة الى الاختبار المتعدد الفحوصات، ومن الجدير بالذكر أيضاً أن التعلم العميق يستخدم في تشخيص الأمراض، وللأسف فإن السرطان،
ومع ذلك فإن العديد من الأطباء على ان يعوض الذكاء الاصطناعي الإنسان في الطب بشكل كامل، حيث يتناول هذا البحث
الاستعمالات الممكنة للذكاء الاصطناعي في قطاع الرعاية الصحية والتحديات التي تواجهها في نطاق واسع.

منهجية البحث: تعتبر مشكلة تشخيص الحالة الصحية للمريض من أكبر مشاكل القطاع الصحي خاصة في البلدان التي تعاني من
تأخير في هذا القطاع ومنها العراق في هذا البحث نحاول ان نوضح كيف يمكن لتعليم الآلة و التعليم بعمق تحسين
كفاءة الرعاية الصحية والطرق الإدارية للقطاع الصحي وكيفية توظيفها في القطاع الصحي في العراق او الاطلاع على اخر التطورات في
هذا المجال على اقل تقدير والتغلباً ما تفوق البشر في تشخيص الكثير من الامراض حيث تقوم الخوارزميات المستعملة في هذا الجانب
بالعمل أفضل من الأطباء المختصين في اكتشاف الأورام الخبيثة، حيث ان
لتكنولوجيا الرعاية الصحية خوارزميات معشبكة ذاتية التعلم يمكن ان تزيد من جودة العلاج من خلال تحليل البيانات الخارجية عن حالة المريض، و
لأشعة السينية، والأشعة المقطعية، والاختبار المتعدد الفحوصات.
ومن الجدير بالذكر أيضاً أن التعلم العميق يستخدم في تشخيص الأمراض، وللأسف فإن السرطان.