APPLICATION OF ARTIFICIAL INTELLIGENCE IN MEDICAL EDUCATION AND MEDICAL DIAGNOSTICS

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Abstract: The field of artificial intelligence (AI) is a recent addition to technology. Its goal is to simulate, extend, and expand human intellect via the study and development of theory, method, technique, and application system using computer technology. New artificial intelligence technologies have brought about significant changes to the traditional medical setting. For instance, a patient's diagnosis derived from biochemical, endoscopic, ultrasonographic, radiographic, and pathological exams has been successfully advanced with reduced human workload and increased accuracy. Better surgical outcomes have significantly improved the medical care provided during the perioperative phase, which includes preoperative planning, surgery, and postoperative recuperation. AI technology has also significantly influenced the development of medicinal drugs and changed the course of medical administration, teaching, and research. This review's objectives are to outline the use of AI in medicine and offer a forecast for the next developments.

Keywords: artificial intelligence, medicine, education, diagnostics, synopsis.

Introduction: The future of artificial intelligence in medicine is still up for debate. Machines (computers) process large datasets (big data) using layered mathematical models (algorithms) to find patterns that biostatisticians are unable to interpret. AI prediction models are more confident when errors in the algorithms are fixed during training. AI is being used to analyze images in radiology, pathology, and dermatology with success; the diagnostic accuracy and speed of these applications surpass those of medical professionals. The performance of the system is consistently improved by merging physicians and machines, even if diagnostic confidence is never 100%. By using natural language processing to scan the rapidly growing body of scientific literature and compile years' worth of disparate electronic medical information, cognitive systems are changing the practice of medicine. AI may optimize the treatment trajectory of chronic disease patients, identify precision therapeutics for complicated illnesses, eliminate medical mistakes, and enhance subject participation in clinical trials in this and other ways.

AI is a new technological field that employs computer technology to explore and create the theory, method, technique, and application system for the simulation, extension, and expansion of human intellect. The notion of AI was initially proposed in 1950 by the physicist Alan Turing, who is known as the "Father of Artificial Intelligence"; he established the "Turing test" and defined AI as similar to but more complicated than the human brain[1, 2].

With the advancement of AI in recent years, particularly the appearance of deep learning (a branch of computer learning algorithms and the core composition of a new generation of AI technology, which can automatically learn from big data analysis and then artificially and independently make decisions based on the knowledge, including various neural networks such as the deep belief network, convolutional neural network, long- and short-term memory network, and so on), there has been an increase in the number of artificial intelligence (AI) systems [3,4, 5,6].

AI is extensively used in a variety of industries and plays an important part in technological advancements, a new idea has emerged: Artificial Intelligence Plus (AI plus). AI + integrates the achievements and technologies of AI with existing sectors to produce new productivity, innovation, and development. According to AI research, the output-input ratio in medicine is more promising than in other fields [7]. The integration of AI with medicine (AI + medicine) alters the existing medical model and results in a breakthrough advancement. AI plus medicine has also gotten a lot of interest because of its possible possibilities and future. As a result, the purpose of this study is to explore the most current applications of AI and medicine in recent years.

Materials and Methods: Artificial intelligence in medical diagnosis - When a doctor uses AI to diagnose a patient with a certain illness/condition, the time necessary for a diagnosis is dramatically decreased, and diagnostic efficiency is significantly increased.

By analyzing clinical data from radiology (such as X-ray, CT, and MRI), pathology, endoscopic, ultrasonographic, and biochemical examinations for related human body indicators, AI can produce results quickly and replace the ineffective traditional medical model, which is unable to provide timely and accurate conclusions, particularly for complex diagnoses. Furthermore, because AI can solve problems in such a short period, doctors may devise a more thoughtful and reasonable treatment plan based on the patient's situation.

Artificial Intelligence in Assistance with Rehabilitation: In the realm of postoperative rehabilitation, AI technology also plays an important part in the healing process.

For example, in the itensive care unit (ICU), the use of AI wireless sensors may efficiently gather patient information, eliminate false alarms, and alleviate ICU challenges [8]. With the gradual diversification of AI technology, numerous new tools (monitoring and remote management) have emerged in the field of nursing [9]. AI-powered medical gadgets can aid in patient recovery by addressing rehabilitative needs and accelerating the process [10]. Furthermore, the use of AI robots has hastened limb rehabilitation in sophisticated anthropopathic action direction and assisted patients in achieving a higher level of recovery [11,12]. Furthermore, AI technology has been utilized to assess progression and monitor health, which may be advantageous for discharged patients' management [13, 14].

Artificial Intelligence in Surgery: With the advancement of AI technology, the notion of an AI-enhanced surgical system has emerged.

The most breakthrough production of this notion in the modern period is the Da Vinci surgical AI system. The introduction of the Da Vinci surgical system, a brilliant invention unequaled in human history, enables surgical treatment more minimally invasive, with the benefits of a sharper vision, more precise and easy operation, and even remote operation. This inventive idea enables complex surgical operations to be done using previously difficult and minimally invasive technologies. The Da Vinci surgical AI system is made up of three parts: the surgeon console, the manipulator operating system, and the imaging system. The Da Vinci surgical system was authorized for use in clinical surgery by the US Food and Drug Administration in 2000. The standard surgical model was transformed by this AI system.

Thyroid surgery, for example, was improved in terms of postoperative cosmesis and oice outcomes [15], maxillary surgery was improved in terms of accuracy and safety [16], and gastric, nephritic, and prostatic surgery was improved as evidenced by a high surgical success rate but low complication rate [17-18], and lung cancer surgery was beneficial to patients in terms of postoperative recovery [19]. Aside from the aforementioned elements of surgical operation enhancement when compared to conventional surgical systems, the greatest distinguishing feature of AI surgical systems is "AI," which means that the surgical systems evolved from a nonintelligent to an intelligent form. Profiting from AI technology algorithms such as deep learning, histological diagnosis in vivo and situ during surgery stands on the stage of pathology, making effective incisal edge pathological analysis and real-time tissue biopsy a reality [20].

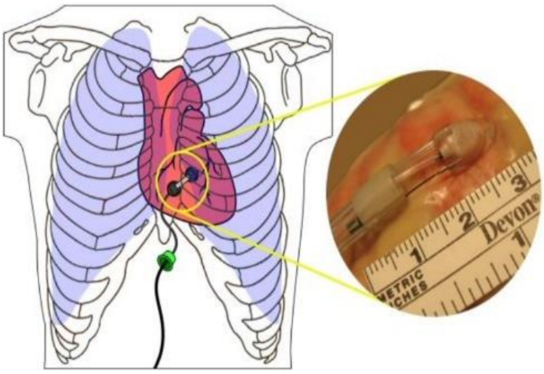
Surgical planning and procedures rely not only on surgeons but also on a program that employs an intelligence algorithm [21]. While AI surgical systems have acquired partial intelligence at this point, they still require human supervision to some level. However, this point will be expanded further and become a hotspot with a promising future, and one day, intelligence will be achieved.

Wek and Strong AI (Artificial Intelligence) - There are two basic approaches to considering artificial intelligence's current use and strength. According to the wek AI theory, machines can only simulate human behavior and consciousness to a limited extent. Weak AI, like that employed in medical diagnosis and therapies, is limited to a certain task. Weak AI suggests that software is a simulation of a cognitive process, not the activity itself. According to the strong AI (Artificial Intelligence) hypothesis, a program running on a machine that has not yet been designed can mimic the actions of a human mind, including understanding and consciousness.

Artificial Intelligence in Education: The typical hospital management strategy focuses on the administrative department's overall planning, which can lead to omissions and inefficient distribution of medical resources. Regulations for AI technologies have undergone significant changes. Scholars have used short-term memory neural network AI technology to predict accurate waiting times in emergency departments, improving medical efficiency, patient experience, and resource redistribution [22]. Artificial Intelligence algorithms were used to reduce average hospitalization time by 7%, select the optimal number of beds, and optimize hospital resources and inputs based on patient data, route to hospital, and climate [23]. A real-time prediction approach using artificial neural networks correctly predicted readmission rates, facilitating patient preparation and enhancing hospital management [24]. Artificial Intelligence technology has improved patient counseling, hospital administration, resource allocation, and personalized clinical care [25]. Medical students are the future of medical growth, but their training is challenging owing to the extensive and complex professional knowledge necessary. Medical students' progress will be limited if they solely study textbooks and specimens. AI technology has enhanced the learning experience for medical students, making it more diverse and engaging. AI-based problem-based learning improves student comprehension of clinical disorders [26]. Using an AI system to learn surgery has led to improved performance and confidence among medical students [27]. The AI simulation-based surgical training system, which combines AI and simulation to study surgical skills, provides objective feedback and improves student learning [28]. AI technology can track students' mental health and academic performance, allowing colleges to better understand their students' situations. Additionally, medical students may benefit from 3DP and MR technologies, which offer immersive learning experiences beyond traditional textbooks. The 3DP medical model, powered by intelligent algorithms, allows students to study three-dimensional anatomy and practice surgical skills [29, 30]. MR technology can enhance students' understanding of human anatomy by allowing them to manipulate any size or layer, allowing for risk-free simulation of surgery training [31]. 3DP or MR-based support approaches are commonly used in medical education.

Artificial Intelligence in Endoscopy: AI technology has significantly enhanced endoscope detection, challenging the existing approach and increasing efficiency. Experts believe AI technology can improve the diagnosis of lesions, colorectal polyps, and stomach and esophageal cancer during endoscopy [32], A neural network approach was developed to detect intestinal lesions automatically. Endoscopy paired with the AI algorithm resulted in greater sensitivity and accuracy than the old model [33]. AI combined with endoscopy is effective in diagnosing and classifying disorders [34-36], indicating a promising future for this technology.

Artificial intelligence in Robotic surgery: We are talking about robots that participate in surgical operations, and accompany patients during and after surgery. The surgeon includes "head controllers" that provide movement of the binocular chamber the receiver works from a longstanding console. One on the TV set next to the patient several surgical instruments are attached. The surgeon ordered these instruments before starting, to put them in the operational field. A three-dimensional surgical lens is transmitted to the monitor to ensure the spatial reciprocity of the instruments until the surgeon is next to the console [37]. (picture-1).



Picture-1.

The Heart Lander robot has also become very popular. A tiny mobile robotic heart provides minimally invasive surgery for surgery. Robot stable and localized examination of the entire surface of the heart, mapping and representing a single treatment device. In addition, the device reduces the damage required to enter the heart. A robot under the supervision of a doctor: Enters the chest through a small incision below the sternum, on the surface of the heart approaches, and conducts therapy or surgery on the necessary part of the organ [38].

Artificial Intelligence in the perioperative period: The perioperative phase encompasses three stages: preoperative preparation, surgery time, and postoperative recovery. AI technology has led to significant advancements during the perioperative period.

Artificial Intelligence in 3D Printing (3DP): 3DP uses AI technology in its procedures. Rapid prototyping technique involves layer-by-layer printing of items using powdered metal or sticky biomaterials based on digital model files generated from CT or MRI data using AI technology. Clinical imaging data are imported into intelligent software, such as MIMICS. Ater picking locations of interest, the program generates a virtual three-dimensional reconstruction for printing using algorithm analysis. While human processing may be essential at this level, we believe it will eventually acquire full intelligence. The application of technology in medicine led to significant advancements, particularly in surgical procedures. During preoperative preparation, clinical surgeons may struggle to identify complicated visceral injuries or bone fractures using typical emergency detection methods. Using 3D printing technology, doctors can create a 1:1 real model of an injured part from CT scanning data. This allows for more visual and intuitive information, detailed preoperative planning, and even simulated surgery [39]. 3D printing technology in cardiac and vascular surgery offers a patient-specific model that identifies complicated anatomy and aids with damage orientation, plan-making, and communication with patients [40]. Research indicates that 3DP is essential for preoperative preparation in various surgeries, including dental, orthopedic, spine, urological, and tumor surgeries. It improves preoperative planning and increases operator confidence [41-44]. 3DP plays an important role in both preoperative preparation and the surgical guide stage.

During a surgical procedure, internal fixation and cutting for orthotics or tumor excision can pose challenges, including determining the best angle and location for fixation and preserving normal tissue. Through the preoperative detection data, 3DP can produce an individualized surgical guide and a template for assisting the surgery. With 3DP template navigation in spine surgery, pedicle screw insertion received a safety enhancement and was much easier than traditional methods; meanwhile, the risk of surrounding neurovascular damage was effectively reduced, and the radiation exposure was also decreased [45, 46]. Shortly, 3D printing technology will be able to create fully functional organs, leading to the next step of Organ Bioengineering [47].

Conclusion: AI technology is a high-tech product that evolves with the modern period. It is a natural outcome of scientific and technological advancements and follows a trend throughout time. Hman society has undergone two industrial revolutions: the steam revolution and the electrical revolution, both of which significantly impacted daily life and advanced civilization. The scientific and technological revolution, including AI technology, has become unstoppable and spread like wildfire. AI technology has revolutionized the medical field, allowing for more accurate and efficient patient diagnosis through radiological, pathological, endoscopic, ultrasonographic, and biochemical examinations, reducing human workload. Improved surgical outcomes led to major improvements in medical treatments throughout the perioperative period, including preoperative preparation, surgery, and recuperation. AI technology has significantly impacted medical medication manufacturing, management, and education, transforming these fields.

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