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APPLICATION OF ARTIFICIAL INTELLIGENCE IN MEDICINE: AN OVERVIEW

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ABSTRACT

Artificial intelligence (AI) is an emerging technical field that employs computer technology to investigate and formulate the theories, methodologies, techniques, and application systems for the replication, enhancement, and augmentation of human intelligence. The traditional medical environment has undergone significant transformation with the aid of advanced AI technology. A patient's diagnosis derived from radiographic, pathological, endoscopic, ultrasonographic, and biochemical assessments has been significantly enhanced in accuracy while reducing human workload. The medical interventions throughout the perioperative phase, encompassing preoperative preparation, the surgical procedure, and postoperative recovery, have been markedly improved, resulting in superior surgical outcomes. Moreover, AI technology has significantly influenced pharmaceutical production, healthcare management, and medical education, steering them towards a new trajectory. This paper aims to elucidate the application of AI in medicine and to forecast future trends.

KEY WORDS: Artificial Intelligence; Medicine; Application; Overview; Medical Environment

INTRODUCTION

Artificial intelligence (AI) is an emerging technical field that employs computer technology to investigate and formulate the theories, methodologies, techniques, and application systems for the replication, enhancement, and augmentation of human intelligence. The notion of artificial intelligence originated in 1950 with physicist Alan Turing, recognized as the "father of artificial intelligence"; he formulated the "Turing test" and characterized AI as analogous to, yet more intricate than, the human brain [1-4].

Recent advancements in artificial intelligence, particularly the emergence of deep learning—a subset of computational learning algorithms and a fundamental component of next-generation AI technology—have enabled autonomous learning from extensive data analysis, facilitating independent decision-making based on acquired knowledge. This encompasses various neural network architectures, including deep belief networks, convolutional neural networks, and long- and short-term memory networks [5-9]. Consequently, there has been a notable increase in interest in this technical field and the implementation of numerous artificial intelligence systems in practical applications, such as the Internist-1 system, MYCIN system, CASNET system, along with various databases and record systems. Artificial intelligence is being extensively utilized across various domains and serves a crucial role in technological advancements, resulting in a novel concept: Artificial Intelligence plus (AI plus). AI + leverages advancements and technologies in artificial intelligence, integrating them with established sectors to foster new productivity, innovation, and development. Research in artificial intelligence has shown that the output-input ratio in medicine is more favorable than in other domains. The integration of AI and medicine transforms the conventional medical model and facilitates a breakthrough advancement. The integration of AI and medicine has garnered significant attention owing to its promising prospects and future potential. This paper is to examine the most recent applications of artificial intelligence in medicine.

ARTIFICIAL INTELLIGENCE IN MEDICAL DIAGNOSIS

When a doctor utilizes AI to diagnose a patient with a certain ailment or condition, the duration needed for diagnosis can be substantially diminished, and diagnostic efficiency can be markedly enhanced. Through the analysis of clinical data from radiology (including X-ray, CT, and MRI), pathology, endoscopy, ultrasonography, and biochemical assessments of pertinent human body indicators, AI can rapidly produce results and transform the ineffective traditional medical model, which often fails to provide timely and accurate conclusions, particularly for complex diagnoses. Moreover, while AI can resolve issues rapidly, physicians can formulate a more considered and rational treatment strategy based on the patient's situation [10-15].

ARTIFICIAL INTELLIGENCE IN RADIOLOGY

Radiology currently serves as a scientific and intuitive foundation for medical diagnosis in nearly all disorders. The need for radiological diagnoses is rising rapidly each year; however, the development of medical professionals cannot occur instantaneously, and the number of physicians experienced in radiation medicine is growing gradually. The widening imbalance between the supply and demand for medical practitioners in this field is resulting in elevated occupational pressure and increased misdiagnosis rates. Consequently, it is of considerable practical importance to explore other methods, such as AI, to mitigate the pressing problem. In radiological diagnosis, various uses of AI have emerged in recent years. During AI deep learning research, Francesco discovered a novel algorithm exhibiting excellent sensitivity for the early screening, rapid diagnosis, and grading of retinal disorders, which has also been corroborated by additional studies. Furthermore, [11] developed an AI-assisted diagnostic (CADx) system utilizing clinical CT data to differentiate between malignant and benign lung nodules by examining 243 patients with verified pulmonary nodules; he established the viability of the CADx system for precisely identifying the characteristics of lung nodules and its applicability for the early detection of subtle lung cancer. Furthermore, his team integrated quantitative imaging (QI) features (AI technology) and serum biomarkers from 173 patients with pulmonary nodules to enhance the classification performance of the system. The results were promising, indicating superior CADx system efficacy when employing QI features compared to utilizing serum biomarkers alone [12]. A study conducted by [13] examined the efficacy of clinical doctors versus AI, specifically comparing the independent performance of an AI system to that of radiologists in diagnosing breast cancer via X-ray. Analyzing a total of 2,652 examinations, the study found that the AI system's performance was statistically comparable to that of clinical radiologists, indicating that the AI achieved an accuracy equivalent to that of experienced radiologists in breast cancer diagnosis. Breast cancer screening enhanced by intelligent technology outperformed clinical radiologists, demonstrating a reduced misdiagnosis rate and an 88% drop in workload; furthermore, the automatic preselect function substantially alleviated demands on clinicians. Moreover, in the processing of MRI data, an AI algorithm has demonstrated superiority over human observers, significantly enhancing the identification rate of mild inflammation in early rheumatoid arthritis [16-18].

ARTIFICIAL INTELLIGENCE IN PATHOLOGY

Pathology is the cornerstone of tumor and lesion diagnosis. Due to advancements in pathological scanning techniques and the enhancement of associated software, whole-slide imaging technology has become a standard diagnostic approach in pathology. Nonetheless, challenges persist regarding the automatic and quick analysis of pathological pictures to get a correct diagnosis, necessitating an urgent resolution. Certain experts have asserted that "AI represents the subsequent advancement and future of precision pathology" and have suggested a novel framework [19-23]. The utilization of AI in pathology has demonstrated promising potential for diagnostic prediction. The enhancement of the AI algorithm during the analytical work has improved the procedures of pathological picture segmentation, tumor identification, and metastasis determination, resulting in higher quality outcomes and reduced timeframes. Furthermore, studies indicate that in certain instances, the AI system surpasses expert clinical pathologists in diagnosing abnormal images [23]. Hart employed a convolutional neural network to differentiate between Spitz and typical melanocytic lesions, two distinct disease kinds, yielding remarkably high accuracy. Kosaraju has suggested a new multi-task model utilizing AI deep learning that can concurrently process multi-scale patch images for pathological image analysis. Upon evaluating the pathological images of well-, moderately, and poorly differentiated gastric cancer, the novel model demonstrated superior efficiency and accuracy compared to other current AI methodologies [24-26]. the deep learning model can predict six genetic alterations linked to cancer and aid physicians in identifying the subtype and gene mutation in cancer diagnosis, achieving a high accuracy of 97%; the model code is available online. Moreover, AI has been employed in the diagnosis of epithelial malignancies, lung cancer, basal cell carcinoma, and glomerulosclerosis [27–31]. These advancements underscore the feasibility of AI technologies utilized in pathology.

ARTIFICIAL INTELLIGENCE IN ENDOSCOPY

AI technology augmentation has significantly advanced endoscopic detection, transforming the previous approach and enhancing efficiency. Experts assert that AI technology can significantly enhance the identification of lesions, colorectal polyps, and stomach and esophageal cancers using endoscopy. Endoscopy presents a compelling technology for AI enhancement with substantial potential; following deep learning, the AI system can markedly improve the diagnosis of gastrointestinal disorders, such as Barrett's esophagus, squamous carcinoma, and gastric cancer, by reducing detection time and increasing diagnostic precision. Furthermore, certain scholars have compiled 7556 clinical images obtained via endoscopy were subsequently analyzed using AI technology to develop a practical neural network algorithm for the automatic detection of bowel lesions; the findings indicated that the combination of endoscopy and the novel AI algorithm exhibited superior sensitivity and more precise localization of bowel lesions compared to the conventional model [32-34]. As research increasingly validates the viability of AI in conjunction with endoscopy for the detection and classification of many disorders, the future of this technology appears promising.

ARTIFICIAL INTELLIGENCE IN ULTRASONOGRAPHY AND BIOCHEMICAL ASSESSMENTS

The implementation of AI technology similarly enhances diagnostic accuracy in ultrasound and biochemical assessments. Despite the implementation of image-based computer-aided diagnosis (CAD) systems by physicians for ultrasound diagnostics, their efficacy is predominantly contingent upon the detection and classification methodologies employed. The integration of AI technology has significantly transformed methodologies. Nguyen has presented a novel AI-based ultrasonographic image processing method that effectively improves thyroid nodule classification outcomes [35-38]. Additional researchers have corroborated that the application of AI can enhance the conventional ultrasonographic identification of cancers in the thyroid, breast, bronchia, puborectalis muscle, and urogenital hiatus, along with various obstetric and gynecological disorders, demonstrating great efficiency and accuracy [39–44].

Furthermore, following an extensive study of clinical examination data utilizing a big-data model, AI has achieved notable advancements in the diagnosis of clinical diseases. Abelson has created a predictive approach for acute myeloid leukemia (AML) by employing deep sequencing to analyze genes often altered in AML and doing extensive research of huge electronic health record databases, thereby facilitating earlier detection and monitoring. Moreover, Sun accurately forecasted the radiomic signature and clinical results of anti-PD-1/PD-L1 immunotherapy by examining CT images and RNA sequencing data from patients with malignant tumors through an AI algorithm [46]. Through the analysis of genetic and associated clinical characteristics, AI aids in the diagnosis of Noonan syndrome, a prevalent autosomal condition, particularly in atypical cases. Furthermore, the implementation of AI deep learning to establish a composite model integrating several clinical assessments, such as lung function tests, bronchial evaluations, and biochemical analyses from 556 patients, significantly enhanced the prediction and diagnosis of early-stage asthma.

Conversely, other scholars assert that AI has a role in clinical diagnosis, although its significant impact may unfold gradually over an extended duration and will not supplant physicians in the near term. In summary, at the present the integration of AI with diagnostics has been the prevailing trend and will persist in its growth [45-59].

ARTIFICIAL INTELLIGENCE IN MEDICAL TREATMENT

ARTIFICIAL INTELLIGENCE IN SURGICAL PROCEDURES

The most significant accomplishment and application of AI in surgery is the surgical AI system. Approximately two decades ago, PUMA-560, Probot, AESOP, Robodoc, and Acrobot served a beneficial supportive function in surgical procedures. Initially, all surgical devices required human oversight, rendering them merely advanced, flexible scalpels devoid of intelligence.

The advancement of AI technology has prompted the proposal of an AI-enhanced surgical system. In the modern period, the most revolutionary implementation of this notion is the Da Vinci surgical AI system. The Da Vinci surgical system is an unparalleled innovation in human history, enhancing surgical treatment through minimally invasive techniques, offering superior imaging, increased precision and convenience in operation, and the capability for remote procedures. This innovative device enables intricate surgical procedures to be conducted with minimally invasive techniques that were previously challenging. The Da Vinci surgical AI system comprises three components: the surgeon console, the manipulator operating system, and the imaging system. In the year 2000, the United States. The Food and Drug Administration authorized the use of the Da Vinci surgical system in clinical surgery. This AI system transformed the conventional surgical paradigm. The implementation of the Da Vinci surgical AI system enhanced thyroid surgery regarding postoperative aesthetics and vocal outcomes [53], improved maxillary surgery in terms of precision and safety [54], and demonstrated high surgical success rates with low complication rates in gastric, nephritic, and prostatic surgeries [55–57]. Additionally, lung cancer surgery yielded advantageous postoperative recovery for patients [58]. Aside from the aforementioned enhancements in surgical operations, the most notable feature of AI surgical systems, in contrast to traditional surgical systems, is their transition from a nonintelligent to an intelligent form. Utilizing algorithms such as deep learning in AI technology, histological diagnosis in vivo and in situ during surgery has advanced the field of pathology, enabling fast incisal edge pathological examination and real-time tissue biopsy. Utilizing deep learning, the AI algorithm may autonomously deduce insights from extensive tests conducted by clinical surgeons and reconstitute clinical digitized data by uploading the surgical program to an AI surgical platform [60].

A system to intelligently aid surgery, encompassing the formulation of surgical excision ranges, assurance of postoperative organ residual volumes, and prediction of lymph nodes with potential positive metastases. Surgical planning and techniques depend not only on surgeons but also on the program utilizing the intelligent algorithm [61]. At present, while AI surgical systems have attained a degree of intelligence, they still require human oversight to some level. This concept will be further elaborated upon and is poised to become a focal point with significant potential, ultimately leading to the realization of comprehensive intelligence.

ARTIFICIAL INTELLIGENCE IN THE PERIOPERATIVE PERIOD

The perioperative period encompasses the entire duration surrounding a surgical procedure, from the patient's receipt of surgical intervention to first recovery. It has three phases: preoperative preparation, the surgical phase, and postoperative recovery. The perioperative phase has witnessed numerous advancements through the implementation of AI technologies [61].

THREE-DIMENSIONAL PRINTING (3DP)

3DP is a technology that partially utilizes AI technology in its procedures. This is a form of rapid prototyping technology that employs powdered metal or other sticky biomaterials to fabricate objects by layer-by-layer printing, guided by digital model files generated from CT or MRI data with AI technology. Clinical imaging data are imported into advanced software such as MIMICS. Following the operator's artificial selection of locations of interest, the software may efficiently generate a main virtual three-dimensional reconstruction using algorithmic analysis for printing. While additional human processing may be required at this level, we are certain that it will ultimately attain complete intelligence. The application of technology in medicine significantly advanced the field, particularly in surgery. For instance, during preoperative preparation, clinical surgeons may struggle to identify critical factors in emergency situations involving complex visceral injuries or bone fractures using conventional detection methods. Nevertheless, when integrated with the preliminary phase of 3D printing technology—Model Printing—physicians can possess a 1:1 replica of the injured area reconstructed from actual CT scan data, thereby obtaining more visual and intuitive information, formulating more comprehensive preoperative plans, and even rehearsing a simulated surgery on the model beforehand. Researchers have noted that in cardiac and vascular surgery, 3D printing technology offers a distinctive patient-specific model that identifies intricate anatomy and aids in injury assessment, planning, and patient communication. Furthermore, extensive study has demonstrated that 3D printing is crucial in the preoperative preparation for dentistry, orthopedic, spine, urological, and certain tumor procedures, from augmenting preoperative planning to improving the the operator's confidence over the surgery [62–67]. 3DP is essential not only in preoperative preparation but also throughout the surgical phase, particularly in the subsequent step of Surgical Guide. During a surgical procedure, there are inherent requirements for internal fixation and incision for orthotic applications or tumor resection. Consequently, challenges may emerge regarding the optimal angle and site for fixation to ensure maximum efficacy, as well as the precise location of the incision to preserve as much normal tissue as possible. Utilizing preoperative detection data, 3DP can generate a customized surgical guide and a template to facilitate the procedure. The implementation of 3DP template navigation in spinal surgery has significantly improved the safety and ease of pedicle screw insertion compared to conventional techniques; concurrently, the risk of adjacent neurovascular injury has been substantially mitigated, and radiation exposure has been minimized. Furthermore, the utilization of 3D printing template navigation in osteotomy procedures for tibial deformities and total knee arthroplasty has been documented; in comparison to traditional techniques, both the duration of the operation and overall efficiency were markedly enhanced with 3D printing technology [68–72]. In tumor excision, 3DP technology aids in accurately identifying and verifying the incision point in bone tumor surgery, yielding favorable postoperative outcomes and minimizing the risk of damage to essential structures while preserving more healthy tissue. Furthermore, the latest advancement in 3D printing technology—Body Implant—effectively facilitates the rebuilding of human tissue using bioactive materials, which encompass scaffold materials, functional cells, and active factors. Following printing and sterilization, the implant may be utilized during surgery to substitute damaged and defective human tissue for numerous reasons. The utilization of polymers, bioceramics, and composites as bioinks for the fabrication of customized bone scaffolds has demonstrated improved surgical outcomes and patient satisfaction; in cases of extensive mandibular defect reconstruction surgery, the damaged tissue was completely restored via 3D printing technology. In orthopedic surgery, the integration of the mirror-replication technique with 3D printing technology offers promising solutions for the persistent issues of cranial and limb bone defects, which previously depended on bone transplantation—a procedure fraught with complications—utilizing conventional surgical approaches. Likewise, 3DP substitution has been extensively utilized in neurological illnesses, skeletal muscle regeneration, arthroplasty, aortic valve replacement, and pelvic disorders in urology and gynecology [73–80]. Moreover, in the imminent future, 3D printing technology will achieve the objective of fabricating entire functional biological organs, advancing to the next phase—Organ Bioengineering.

Virtual Reality, Augmented Reality, and Mixed Reality Virtual Reality (VR), Augmented Reality (AR),

Mixed reality (MR) technologies represent a novel category of digital holographic imaging technologies that, much to 3D printing, utilize artificial intelligence to partially reconstitute clinical data throughout their operations. Virtual reality (VR) is a wholly digital image produced by an advanced computer algorithm, offering surgeons a platform to practice within a virtual environment, free from the severe repercussions of operational errors, so enhancing their surgical skills. Nevertheless, the absence of practical expertise precludes the application of VR in actual surgical procedures. Augmented reality (AR) integrates intelligent augmented information with the physical environment, distinguishing it from virtual reality (VR) due to its emphasis on the real world. Following the transformation of patient data and the virtual reconstruction of the critical area, augmented reality (AR) technology can effectively aid in surgery, either preoperatively or intraoperatively, by identifying intricate anatomical structures and facilitating navigation during the procedure. Nonetheless, the cumbersome apparatus for augmented reality navigation systems continues to impose constraints during surgical procedures. The emergence of cutting-edge digital holographic imaging technology MR facilitates the integration of VR and MR, transcending the divide between virtuality and reality, so effectively addressing the issue. MR encompasses three characteristics: the integration of virtuality with reality, real-time interaction, and accurate matching [51]. The MR system, consisting of relatively portable devices (e.g., a wearable MR device, the Hololens, and the latest Microsoft technology), facilitates real-time interactive environments and vivid visual experiences, enabling clinical surgeons to immerse themselves in a mixed surgical context and devise enhanced therapeutic plans; furthermore, communication between doctor and patient is augmented. This technology has been implemented across various domains, including spinal, orthopedic, hepatic, renal, and cranial procedures, providing intraoperative guidance that reduces operation time while enhancing surgical precision and safety. Moreover, MR has fulfilled the criteria for telemedicine, which is crucial for healthcare in rural and remote regions, as information can be sent in real time using internet communication systems. In comparison to the aforementioned 3DP technology, MR possesses advantages in timeliness, aside from its superior navigation, as 3DP production can require several hours for printing. Furthermore, MR technology can also facilitate postoperative recovery and regular training [81].

ANESTHESIOLOGY ASSISTANCE

AI technology has been extensively utilized in anesthesiology throughout the perioperative phase. Anesthesia is a critical component of surgical procedures that facilitates a seamless operation; yet, it carries numerous hazards and COMPLICATIONS during anesthesia. The integration of AI technology has primarily advanced six aspects that have garnered significant attention (1) monitoring of anesthesia depth; (2) regulation of anesthesia;

PREDICTION OF UNFAVORABLE EVENTS; HELP VIA ULTRASONOGRAPHY;

pain management; and surgical suite administration. AI technology enhances the safety of monitoring, delivery, and postoperative treatment, hence yielding significant advancements in anesthesiology.

REHABILITATION ASSISTANCE IN THE DOMAIN OF POSTOPERATIVE REHABILITATION,

AI technology significantly contributes to the recovery process. In the intensive care unit (ICU), the utilization of AI wireless sensors can efficiently gather patient data, minimize false alarms, and alleviate problems within the ICU. As AI technology diversifies, numerous new solutions for monitoring and remote management have emerged in the nursing sector. AI-based medical gadgets can facilitate patient recovery, fulfilling rehabilitation needs and accelerating the process. Furthermore, the utilization of AI robots has expedited limb rehabilitation in intricate anthropopathic action guiding and assisted patients in achieving a superior level of recovery [18, 29]. Furthermore, AI technology has been employed to track progression and monitor health, which may enhance the management of discharged patients.

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL MANUFACTURING

The conventional model of drug production necessitates an extensive timeframe, encompassing functional target investigations, drug formulation studies, efficacy assessments, clinical trials, evaluations, and marketing; consequently, despite prolonged research efforts, new pharmaceuticals may not perform as anticipated. Nevertheless, the advancement of AI in recent years has transformed the conventional pharmaceutical sector in healthcare and has expedited new drug research and formulation. Furthermore, as AI-generated pharmaceuticals have matured, both their originality and quality have significantly improved. The integration of AI predictive models with vaccine design has effectively expedited clinical trial processes while reducing research and development expenses and duration. Deep learning technology-driven drug discovery can precisely target proteins as intended, a feat previously deemed unattainable [82-90]. The robust logical deduction and autonomous learning capabilities of AI technology significantly enhanced the design and production of cancer medications, resulting in improved therapeutic efficacy. Furthermore, the investigation of AI-assisted bioinformatics tools and methodologies has shown a promising future for small molecule medicinal therapy[118]. Furthermore, the aforementioned 3DP technology has significantly advanced medication synthesis. Three-dimensional printing in medication production offers patient-specific attributes and enables the selection of drug size, form, and the mixing of various pharmaceutical components, thereby enhancing clinical applications. Utilizing 3DP technology, the layers and percentage factors in tablet coating, as well as therapeutic release rates and patterns, may be predesigned, hence enhancing therapeutic efficacy.

ARTIFICIAL INTELLIGENCE IN MEDICAL MANAGEMENT AND EDUCATION

The conventional model of hospital medical administration depends on the comprehensive planning of the administrative department, often resulting in management oversights and drawbacks, such as the inequitable allocation of medical resources. The regulation of AI technology has significantly altered operations. Certain scholars have employed long-short-term memory neural network AI technology to develop a predictive model and analyze the database of patient hospital stay durations, successfully forecasting precise waiting times in the emergency department, thereby improving medical efficiency, enhancing patients' subjective experiences, and facilitating the redistribution of medical resources. Additionally, a study that examined patient hospital-stay duration, transportation methods to the hospital, and climatic and temporal factors utilized 10 AI algorithms to decrease the average hospitalization time by 7%, determine the optimal number of hospital beds, and enhance the allocation of hospital resources and necessary inputs.

Furthermore, a real-time prediction model utilizing artificial neural networks effectively forecasted the readmission rate, hence facilitating patient preparations and enhancing hospital management. In summary, AI technology has enhanced patient counseling, hospital administration, medical resource distribution, and eventually personalized clinical treatment.

The education of medical students represents the future and potential of medical advancements; nonetheless, the extensive and complex professional knowledge necessitates a prolonged and challenging training period. The advancement of medical students will be impeded if they solely engage with medical texts and specimens. The varied application of AI technology has enriched and diversified the learning experiences of medical students. AI-driven problem-based learning has augmented students' comprehension and cognition, hence enriching their knowledge of clinical disorders. The integration of surgical studies with an AI system has yielded encouraging results.

Outcomes exhibiting enhanced performance and assurance among the medical students [7]. Furthermore, the AI simulation-based surgical training system that integrates artificial intelligence and simulation for the examination of surgical skills has developed a novel teaching instrument that provides objective feedback, advantageous for student learning. AI technology has facilitated the monitoring of students' mental health and academic performance, allowing universities to assess their students' situations more promptly, not only for educational support but also for oversight. Furthermore, the aforementioned 3DP and MR technologies can offer medical students more immersive learning experiences that are not attainable through traditional textbook study. Utilizing advanced algorithms, three-dimensional reconstruction differs from two-dimensional texts; consequently, students can employ the 3D medical model to study three-dimensional anatomical structures and practice surgical procedures on the model to enhance their surgical skills. Moreover, MR technology facilitates a more intuitive comprehension of human anatomy for trainees, allowing them to manipulate any size or layer, hence offering risk-free simulated surgical training. Presently, 3D printing or mixed reality-based support techniques have been extensively utilized in medical instruction.

ARTIFICIAL INTELLIGENCE IN CORONAVIRUS RESEARCH

In late 2019, the emergence of the novel coronavirus disease 2019 (COVID-19) posed significant global threats. The global tragedy significantly impacted human health, safety, the advancement of civilization, and the global economy, resulting in numerous fatalities. Significant advancements in the prevention and treatment of COVID-19 were accomplished by the utilization of several sophisticated medical techniques and cutting-edge technologies, including artificial intelligence. In the effort to manage the proliferation of COVID-19, AI functioned as a substitute for human intelligence to facilitate early detection and diagnosis, treatment monitoring, contact tracing, case and mortality prediction, drug and vaccine development, reduction of medical workload, and disease prevention. In the battle against COVID-19, Zhang created a novel deep learning system to analyze pulmonary CT data, as the quantification and localization of such data could not be accurately and efficiently assessed. He determined that the right lower lobe of the lung is the predominant area for COVID-19 pneumonia occurrences[134]. An AI machine learning system to analyze COVID-19 CT scans, revealing that the algorithm could facilitate early identification and medical intervention [15]. Furthermore, Gadde suggested point-of-care diagnostic systems that integrated radiology,

Pathology and artificial intelligence collectively enhance the diagnosis of COVID-19[136]. Furthermore, Sweta conducted a rapid intelligent screening for potential COVID-19 therapeutics utilizing a drug-repositioning approach; this team successfully identified potentially beneficial drugs through the application of both AI and pharmacological techniques, thereby illustrating the utility of this method in the design and research of COVID-19 medications. This strategy has also been validated by other researchers, who developed a platform utilizing AI learning and predictive models to find market medications with potential for treating COVID-19; consequently, they identified over 80 treatments with significant promise. Moreover, extensive research on AI algorithm help has accelerated the rapid creation of COVID-19 vaccines. Overall, appropriate AI-based technology will ensure the efficacy of early warning, diagnostics, medication development, and medical management in combating COVID-19, facilitating the eventual resolution of the pandemic.

CONCLUSION

AI technology is a sophisticated innovation that aligns with the evolution of the modern period; thus, it is an unavoidable outcome of scientific and technological progress, reflecting contemporary trends. Human society has seen two industrial revolutions: the steam revolution and the electrical revolution, both of which significantly transformed lifestyles and advanced civilization. The scientific and technological revolution, encompassing AI technology, has demonstrated an unstoppable trend that has proliferated rapidly. The medical field has undergone significant transformation due to new AI technologies, enhancing patient diagnosis through radiological, pathological, endoscopic, ultrasonographic, and biochemical examinations with increased accuracy and reduced human workload. The medical interventions during the perioperative phase, encompassing preoperative preparation, the surgical procedure, and postoperative recovery, were markedly improved, resulting in superior surgical outcomes. Furthermore, AI technology has significantly influenced pharmaceutical production, healthcare management, and medical education, steering them towards a new trajectory. The advent of AI heralds a rapid transition that will usher the medical industry into an unparalleled era.

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