Global Trends in Science and Technology

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

From Computational Models to Clinical Impact: The Influence of AI on Modern Healthcare

Nahid Neoaz[1], Mohammad Hasan Amin[2*]

[1]Wilmington University, USA

[2]Kettering University, Michigan

[1]nahidneoaz@yahoo.com, [2]amin3672@kettering.edu

open access

Corresponding Author

Mohammad Hasan Amin
amin3672@kettering.edu

Article History:
Submitted: 04-04-2025
Accepted: 28-04-2025
Published: 03-05-2025

Keywords

AI in healthcare, diagnostics, personalized medicine, predictive analytics, robotic-assisted surgery, telemedicine.

ABSTRACT

The healthcare field transforms with Artificial Intelligence (AI) because it enhances patient diagnosis together with treatment methods and hospital administration while delivering customized medical care. The introduction of AI-based technology in healthcare produces better medical images along with new medication developments and robot-aided surgery along with patient observation systems which result in both higher operational effectiveness and enhanced medical results. AI systems deliver multiple benefits to healthcare by enhancing hospital operation efficiency and enabling predictive analysis followed by inexpensive telemedicine systems which increase health service accessibility. AI implementation faces hurdles because it generates problems about ethics along with data privacy risks and includes biases in algorithms and creates difficulties in regulation and demands costly deployments. AI deployment requires doctors to maintain medical regulations compliance along with transparency and accountability practices. Ethical AI deployment needs policymaker and healthcare provider and AI developer joint efforts to build solid frameworks for responsible AI mechanisms. Modern medical science and treatment processes along with research advancement have not removed but remain possible because of AI's revolutionary capabilities. The future of healthcare depends on AI to build an improved system based on accuracy and efficiency and patient-centered care because of ongoing innovation with proper governance.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

INTRODUCTION

Medical research together with diagnostic procedures and treatment planning and patient management benefits from the use of Artificial Intelligence (AI) in healthcare. Computational models developed by Artificial Intelligence enable better clinical choices and raise healthcare process efficiency and deliver customized treatments to patients [1]. The healthcare transformation allowed medical practitioners to detect diseases with greater accuracy while also projecting patient results and enhancing treatment methods which delivers superior medical care at reduced expenses [2].

The utilization of AI technologies for healthcare purposes has existed for quite some time. Modern medical applications of artificial intelligence become possible because of increased calculations speed and access to extensive medical data coupled with deep learning systems. Modern AI systems analyze pictures from medical settings while they detect irregularities in radiology pictures along with supporting robotic surgical procedures and making disease outbreak predictions by processing epidemiological information [3]. Healthcare breakthroughs occur thanks to AI conjunctions which apply patient-detailed information to build unique treatment plans and utilize AI techniques to find drug possibilities at faster rates.

Medical institutions face multiple barriers while working to bring AI systems into their clinical operations. Multiple ethical concerns persist regarding patient information security as well as algorithmic imbalance together with the necessity of regulatory supervision. Healthcare practitioners need proper training to decode AI-generated medical recommendations for protecting patient safety and sustaining trust between patients and AI-assisted medical services [4]. A multidisciplinary method involving medical specialists together with data science experts and regulatory personnel needs to create AI solutions that merge both effectiveness and ethical compliance [5].

The paper seeks to study AI's comprehensive healthcare influence that starts with mathematical frameworks and extends to clinical healthcare practice. This research identifies essential AI applications in diagnosis and treatment planning alongside hospital operational systems and reviews resulting challenges and ethical aspects in AI deployment. Complete knowledge about AI's effects on healthcare enables stakeholders such as medical practitioners and policy makers to create conditions where AI systems support better medical results and operational efficiency and increased patient wellness [6].

Global Trends in Science and Technology
ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

THE EVOLUTION OF AI IN HEALTHCARE

Medical AI applications have developed substantially since their beginning as rule-based systems because deep learning models can now surpass human expertise in several medical operations. Healthcare AI has advanced through three main factors including faster computers, bigger medical databases and better algorithm capabilities [7]. The implementation of AI has become essential for all medical functions that include research and patient care in addition to diagnostics and hospital administration.

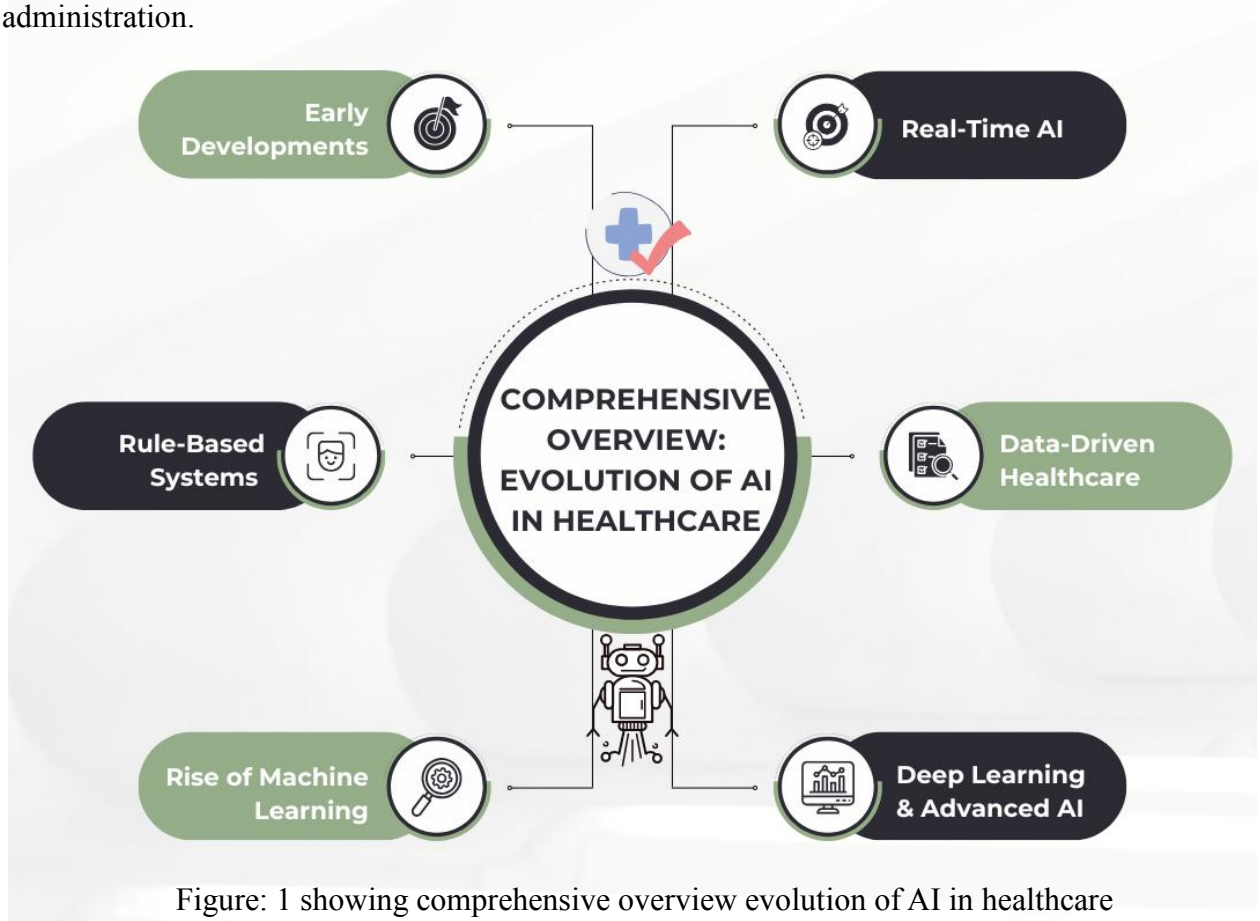

Figure: 1 showing comprehensive overview evolution of AI in healthcare

Rule-based expert systems brought AI technologies into healthcare during the 1970s and 1980s for aiding physicians with medical diagnosis and treatment decisions. CDSS known systems operated through predefined rules to process patient symptoms for possible diagnosis identification. Stanford University developed MYCIN as an early AI system that allowed it to identify bacterial infections through its diagnosing capabilities and suggest antibiotic treatments [8]. The medical diagnosis system known as Internist-1 offered support for identifying complex internal medicine situations during an early phase of artificial intelligence development. The potential of AI in healthcare field was shown through these systems yet their dependence on manual rules created issues for expanding their application and handling emerging medical information [9].

During the 1990s together with the initial years of the 2000s machine learning (ML) emerged as AI

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

systems gained the capacity to extract knowledge from data instead of relying on set guidelines. Healthcare professionals gained access to more medical data because EHRs and imaging datasets and genomic sequences became widely available [10]. The new ML models learned to detect patterns independently across large datasets now that they did not need explicit programming. The first recognizable medical usage of ML incorporated statistical models that forecasted patient results from past information. The analysis used both decision trees and logistic regression to determine disease evolution chances and treatment responses as well as hospital readmission numbers [11]. The improvement of computational power allowed support vector machines (SVMs) together with random forests to join previously used statistical models for medical image analysis and personalized disease prediction.

The recent ten years have seen an explosive growth in AI healthcare progress because deep learning brought momentum to ML through neural networks that process sophisticated medical information. Deep learning provides maximum effectiveness when applied to medical imaging because convolutional neural networks (CNNs) can now match human-level performance in diagnosing conditions such as lung cancer and diabetic retinopathy and Alzheimer's disease [12]. Research teams at Google DeepMind established DeepMind Health as an AI platform which performed eye disease diagnoses using retinal scans with high precision levels during 2016. AI technologies from IBM Watson Health and GE Healthcare supply radiologists with automated assistance to spot tumors and fractures as well as other abnormalities in X-ray and MRI and CT scan images. The new diagnostic systems have enhanced both accuracy rates and operational efficiency through a reduction of healthcare professional workload [13].

AI has become instrumental to precision medicine and drug discovery at the same time that it provides diagnostic support. Studying vast genomic data and clinical records enables AI models to determine treatments that will yield the best results for singular patients. Deep learning through AI enables BenevolentAI and Insilico Medicine to create drug discovery platforms which find new candidates while minimizing pharmaceutical industry costs of conventional research along with development time [14].

AI made significant contributions to COVID-19 treatment research that started during the year 2020. Deep learning examined viral protein structures to search for medications that showed strong potential to fight the virus. Such medical breakthroughs demonstrate that AI speeds up the process of scientific discovery and quickens global pandemic response [15].

AI development will extend its healthcare involvement during upcoming years. Through uniting AI with wearable technology robotics and real-time patient monitoring the medical field can deliver

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

better tailored proactive healthcare services. Explaining AI involves XAI development to enhance operational transparency for medical decisions thus building healthcare professionals' and patients' trust [16]. AI is steadily advancing through ongoing modernization which ensures a profound transformation of contemporary healthcare despite facing ongoing obstacles like data security and algorithmic prejudice together with regulatory complexities. AI stands as an essential tool for medical progress because deep learning has replaced early rule-based systems in medical solutions for worldwide patient care advancement and scientific advancement [17].

COMPUTATIONAL MODELS AND AI ALGORITHMS IN HEALTHCARE

Contemporary healthcare operates as a foundation through Artificial Intelligence (AI) which exists because of its sophisticated computational models and advanced algorithms. Medical AI models enable processing of vast patient data to detect treatment patterns that assist in both clinical and operational diagnoses and treatment selection and facility performance optimization [18]. The healthcare industry utilizes different stages of artificial intelligence with ML and DL algorithms functioning as essential components to improve patient care.

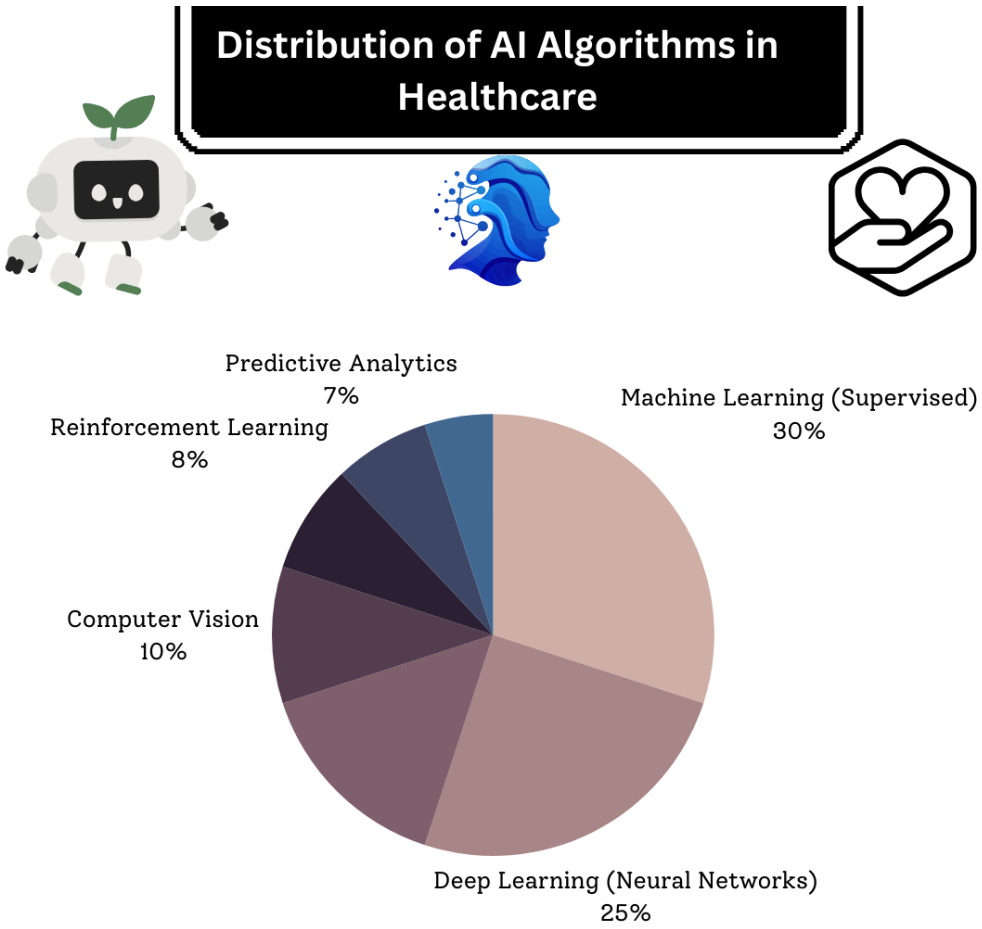

Figure: 2 showing distribution of AI algorithms in healthcare

The implementation of four traditional ML methods including logistic regression and decision trees

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

and support vector machines (SVMs) and random forests performs extensively in predictive analytics tasks. The analysis of medical data structures including patient information and laboratory data and clinical files enables predictions regarding hospital readmission risks and disease-stage development and treatment effectiveness [19]. ML-based predictive systems enable healthcare professionals to identify diabetes at its initial stages and estimate heart disease risks as well as find distinct patterns of cancer in pathology slides.

Artificial neural networks (ANNs) within deep learning which functions as a ML subset transform complex high-dimensional medical data types like images and sequences and voice-based recordings. CNNs have become the fundamental neural network technology which doctors apply to medical imaging work across radiology and dermatology and ophthalmology fields [20]. CNNs receive X-rays and MRIs and CT scans to identify tumors, fractures together with neurological disorders from medical data. The recurrent neural networks (RNNs) and Transformers demonstrate exceptional ability for processing sequential healthcare data including electronic health records (EHRs) and patient histories. The system enables health professionals to predict patients' clinical decline while suggesting individual treatment plans and designing hospital operational processes [21].

The research field of NLP analyzes various pieces of unstructured text that include doctor’s notes together with pathology reports and clinical literature. The automated summary and voice-driven patient care and trial matching capabilities derive from AI-based NLP models that use BERT (Bidirectional Encoder Representations from Transformers) and GPT-based algorithms. Chatbots and virtual assistants make use of NLP technology for boosting patient participation and managing appointment bookings and disease symptom analysis [22].

The application of computational models in healthcare reaches its peak when used to conduct predictive analytics. AI algorithms evaluate past patient data to recognize patterns that_forecast the future health conditions of patients. Machines equipped with AI models perform two central healthcare functions: they analyze standard medical tests to identify health conditions during the asymptomatic period before treatment begins [23]. The detection of diabetic retinopathy by AI-powered retinal imaging systems takes place years before blindness develops. Hospital treatment facilities through AI analytics combine patient monitoring information to predict sepsis among Intensive Care Unit patients. Hospitals apply ML models for determining the readmission risks of patients ahead of their discharge to minimize healthcare expenses [25].

The cancer diagnostic technology from IBM Watson along with the Google Deep Mind models demonstrates excellent performance in both tumor tissue analysis from microscope slides and therapeutic benefit prediction. AI computational models revolutionize both medical drug

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

development as well as individual-specific healthcare through their advanced applications. The normal method for creating new drugs involves a time span of ten to fifteen years with price tags in the billions [26]. AI algorithms transform drug discovery through their capabilities of accelerating the entire process and improving the work of BenevolentAI and Insilico Medicine programs. AI genetic data analysis provides optimized medical plans which specify individualized treatment regimens for cancer patients as well as rare disease patients and chronic illness patients. Using patient treatment responses AI allows physicians to give patients more efficient medications that cause minimal side effects [27].

Computational models in healthcare encounter multiple barriers despite their important applications because they require excellent data quality including avoidance of bias. The application of incomplete or biased or unrepresentative data would result in wrong predictions as well as unequal treatment among patients. The difficulty emerges because deep learning models present as opaque systems which make it hard for medical professionals to understand AI decision-making processes [28]. The healthcare sector supports development initiatives to create explainable artificial intelligence (XAI) systems that enhance the transparency of models. The implementation of AI in clinical decision systems needs to fulfill governmental regulations for patient protection and match privacy requirements under HIPAA and GDPR [29].

AI systems need to work without interruptions in the current EHRs and hospital workflow systems to deliver efficient service and gain acceptance by medical staff. Medical science has benefited from computational models and AI algorithms because they enable advanced disease diagnoses along with predictive analysis and drug research and individualized patient treatments. The clinical effect of AI will increase significantly when it achieves better data quality along with improved model interpretability and better alignment with regulatory standards [30]. Modern healthcare systems will benefit from AI development since it enables better medical determination processes and superior patient results while building an optimized healthcare structure.

AI IN DIAGNOSTICS AND IMAGING

Doctoral experts utilize Artificial Intelligence to advance medical diagnosis capabilities producing rapid and precise and financially beneficial disease identification along with monitoring systems. Medical image examination along with disease identification and healthcare professional assistance in clinical decisions become possible through AI-based machine learning (ML) and deep learning (DL) algorithms [31]. Medical diagnostics together with radiologic analysis have become more precise while pathologist and radiologist workloads decreased as patient results demonstrate better outcomes.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

AI integration reaches its highest level within the medical field of radiology. AI systems detect medical anomalies effectively in imaging tests using mostly convolutional neural networks (CNNs) which process X-rays along with CT scans and MRIs and ultrasound images with high accuracy levels. The detection of lung diseases through invented AI systems trains the models to identify pneumonia and tuberculosis and lung cancer from chest X-rays and CT scans. Some artificial intelligence models currently perform as well as expert radiologists when it comes to diagnostic tasks [32]. AI engines enable the analysis of MRI and CT scans for diagnosing stroke and brain tumors and Alzheimer's disease and multiple sclerosis. The software algorithms identify faint patterns which signal potential neurological conditions in medical brain images.

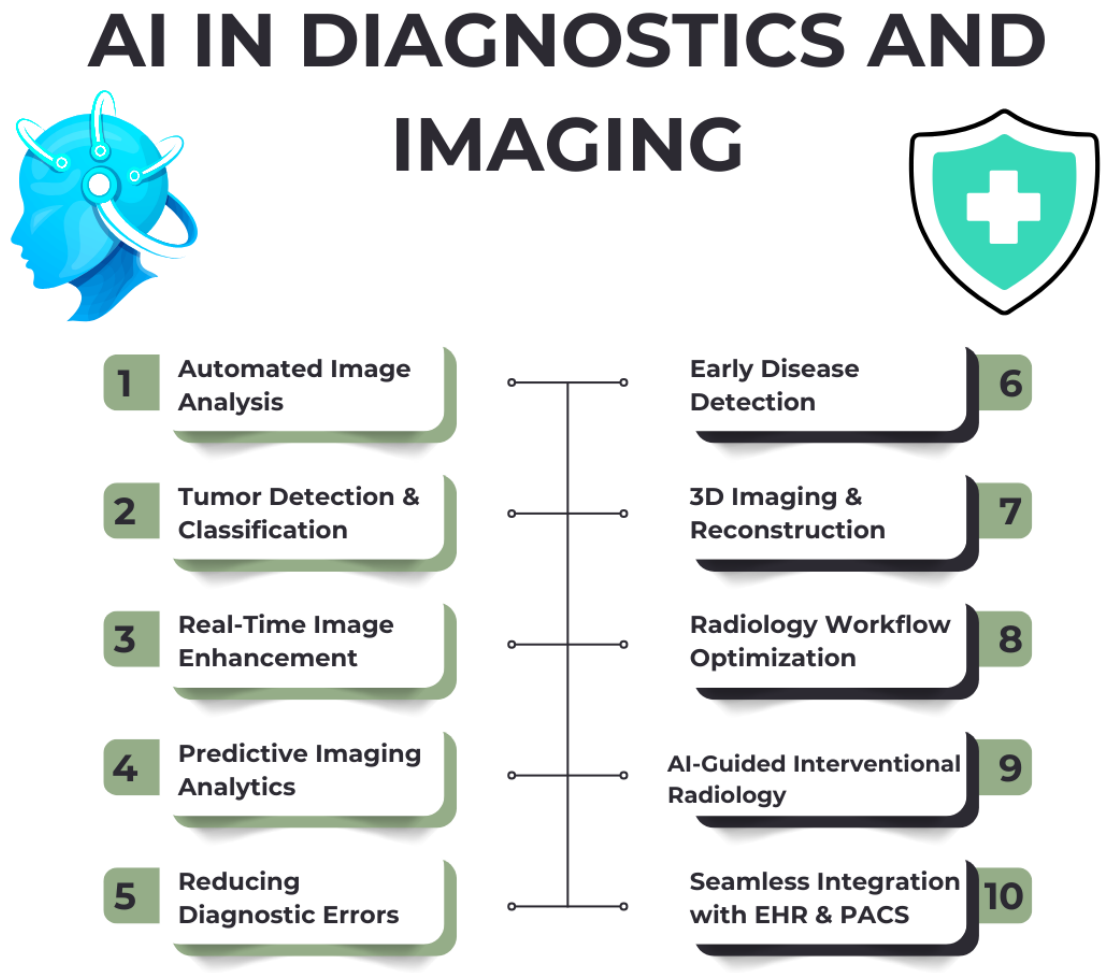

Figure: 3 showing AI in diagnostics and imaging

AI-based mammography analysis performs outstandingly during breast cancer detection because it identifies early breast cancer while reducing incorrect diagnoses. Google Health and IBM Watson Health among other companies have designed AI diagnostic models which exceed human screening capabilities. The analysis of big imaging datasets through automation by AI leads to both higher operational efficiency and improved accuracy of medical diagnosis because it eliminates human

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

mistakes and observer inconsistencies [33].

Pathology performs better through AI-powered image analysis of small tissue samples under the microscope. Medical specialists utilize digital pathology systems supported by AI technology to diagnose cancer cells together with tumor classification and disease evaluation activities. The ability of AI models trained on histopathological slides to detect malignant cells when analyzing tissue structures leads to sophisticated cancer diagnosis processes for breast prostate and skin cancers [34]. Through tumor grading services AI helps medical professionals evaluate the seriousness and evolutionary pattern of cancer.

The analysis of blood smears with AI software allows the detection of malaria and tuberculosis infections and other infectious diseases which decreases the duration of manual microscopic evaluation. Pathological use of AI technology raises diagnosis accuracy while shortening analysis times thus letting specialists handle intricate pathology cases that need human intervention [35]. Through AI systems medical practitioners can identify diseases in their early stages along with determining future disease probabilities before clinical symptoms emerge. The system operated by Google Deep Mind utilizes AI to scan retinal images and detect diabetic eye disease symptoms thus protecting diabetic patients from vision loss [36].

The use of AI enables the examination of electrocardiograms (ECGs) echocardiograms and cardiac MRI scans to discover arrhythmias and patterns that reveal heart failure as well as arterial blockages. Certain AI-powered ECG monitoring systems have the ability to forecast heart attack occurrences ahead of time. Tissue analysis through AI algorithms utilizes X-ray and computed tomography scan readings to determine osteoporosis risk along with the probability of bone fractures [37]. Early disease recognition through AI allows medical staff to establish suitable preventative measures and customize treatment approaches followed by early intervention which results in better patient response. AI-based diagnostics and imaging meets with multiple obstacles because medical practitioners need both excellent quality datasets which represent various patient communities for achieving unbiased diagnostic predictions [38].

AI-based diagnostic tools need to obtain regulatory badges such as FDA and CE certification to reach the market and guarantee patient safety together with clinical precision in diagnoses. All healthcare systems should obtain AI technology that connects directly with hospital software to extend human skills rather than substitute medical staff with automated mechanisms. The major challenge for clinicians stems from black box operations of many AI models which make their decision-making processes difficult to comprehend [39]. Scientists work to develop explainable AI (XAI) for delivering results which both nurses and patients can understand. AI techniques in medical

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

diagnostics and imaging both enhance disease detection at earlier stages and lower diagnostic mistakes and boost clinic operation productivity. AI technology's advancement will expand its medical applications at all stages of radiology and pathology while enabling risk evaluation to contribute heavily to precise medicine and operational enhancement and patient survival [40]. The acceptance and reliance on AI in healthcare depends heavily on advancements related to explainable AI as well as ethical AI and regulatory compliance.

AI IN PERSONALIZED MEDICINE

The healthcare approach of personalized medicine works by creating specific medical treatments that match individual patient characteristics. Healthcare providers achieve more successful and less harmful therapies by studying genomic and life-style characteristics and environmental conditions of patients [41]. The primary role of Artificial Intelligence in medical applications involves handling big medical information and discovering advanced patterns which enables the prediction of personal treatment responses. AI technologies have fundamentally changed the practices of diagnosis along with the development and individualized treatment of medicines [42].

The human genome sequencing discovery allows doctors to detect and treat diseases through molecular research methods. AI systems apply essential functions to decode genomic information while discovering genetic mutations that trigger diseases and determining the probabilities of disease development in patients [43]. AI enables genomic evaluation of cancers which discovers particular genetic abnormalities that cause cancer to help medical professionals prescribe precise therapies by using immunotherapy and gene therapy. AI models evaluate liquid biopsies through blood testing for cancer genetic materials while tracking disease evolution [44].

Patients commonly experience difficulties relating to diagnostics due to rare diseases because most possess genetic origins. Patients can benefit from AI genomic analysis because this technology enables fast detection of rare disorders by comparing patient genomic data against extensive reference databases better than human practices. Pharmacogenomics benefits from AI because it uses genetic information to forecast medicine reactions [45]. Doctors benefit from this system because they can find the most beneficial medication without safety concerns for each individual patient. AI applications in genomics allow scientific teams to generate bespoke solutions for medical treatments by acknowledging each person's specific biological structure [46].

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

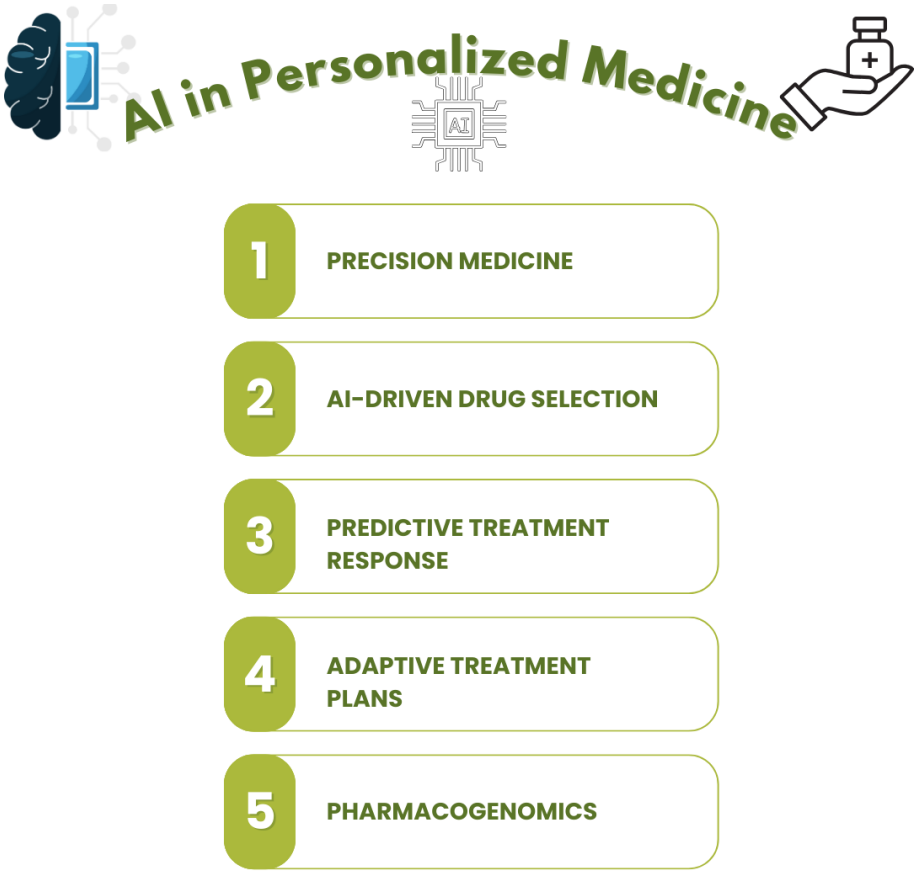

Figure: 4 showing Ai in personalized medicine

Drug discovery operations through traditional means demand excessive time and high costs before achieving market approval during a duration spanning 10–15 years. AI speeds up these operations through two functions: First it analyzes extensive biological information to find potential drug targets based on human-body molecule interactions. Second it repurposes currently authorized drugs by finding different application methods [47]. The analytical power of AI systems allows pharmaceutical companies to find additional treatments from drugs which are already available on the market thereby decreasing development expenses during the pharmaceutical research. AI models identified possible antiviral drugs as one of their contributions during the COVID-19 pandemic. The combination of AI with clinical trial design enables researchers to choose treatment-responsive patient populations that results in higher success rates together with reduced expenses [48].

Using AI healthcare professionals develop personalized treatments that integrate information collected from medical databases along with wearable monitoring outputs and imaging examination data. The use of AI enables medical professionals to predict cancer tumor behavior toward treatment options which helps them select optimal therapeutic approaches with reduced unwanted effects [49]. This represents one instance of AI integration in pharmaceutical applications. For example IBM

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

Watson for Oncology generates AI-based treatment suggestions which use both medical facts and genetic make-up data from patients [50].

AI-based applications developed by Google's DeepMind together with Medtronic evaluate diabetes metrics alongside diet practices and exercise to establish personalized insulin treatments with dietary guidance for patients with diabetes. AI-enabled mental health treatments allow patients to receive intervention through analysis of voice expressions and facial motions and smartphone actions which help identify depression indications at their early stage so clinicians can provide customized therapy suggestions [51].

The development of personalized medicine through AI has encountered several related obstacles because genomic and medical information requires absolute privacy protection. Healthcare providers need to emphasize patient privacy protection together with following HIPAA and GDPR legal mandates. The healthcare outcomes which AI models deliver become inequal when they use data sets containing biases [52]. AI systems need training data which represents all types of people accurately. For AI-driven personalized medicine tools to reach clinical use they need to fulfill thorough regulatory assessments and clinical approval procedures determined by agencies such as the FDA and EMA. Healthcare providers need to adopt AI models when these models demonstrate capability to integrate with electronic health record systems (EHRs) along with clinical operational workflows [53].

Through AI technology the advancement of personalized medicine reaches new heights because it enables bulk genomic processing and drugs discovery platforms and individualized treatment plans. The use of AI-driven insights enables healthcare providers to supply treatments which are exact, productive with patient-specific limitations that improve medical results. The successful integration of AI technology into personalized medicine needs the solution of data privacy matters as well as bias elimination and regulatory clearance issues [54]. Modern technological advancements through AI precision medicine practices will transform healthcare by developing treatment solutions that target specific needs and remain effective and widely accessible.

AI IN HEALTHCARE OPERATIONS AND MANAGEMENT

Intelligent artificial systems have transformed healthcare administrative practices while generating operational efficiency and decreasing expenditure while upgrading patient care quality. Specific AI-based automation procedures plus predictive analytical systems with intelligent decision support tools help healthcare facilities optimize workflow efficiency as well as allocate resources effectively while improving delivery outcomes [55]. Healthcare systems achieve higher patient care quality when they apply an AI integration to administrative operations because the system can eliminate inefficiencies

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

while putting more resources into patient care. Healthcare facilities constantly produce large pools of administrative information through patient documentation combined with billing procedures and staff workforce schedules. Medical professionals allocate their time toward patient care and lower human errors because AI takes over these administrative tasks [56].

EHR management benefits from NLP technology that enables automatic data entry and patient history summarization and helps extract valuable information from non-structured medical documentation. The system also decreases doctor exhaustion while providing better information precision. The predictive capabilities of AI scheduling platforms enhance staff scheduling and allocation of operating rooms to diminish both wait times and surplus patients in hospitals [57]. AI-powered chatbots with virtual assistant capabilities help patients by responding to their inquiries as well as creating appointment slots and delivering medication alerts and providing minimal healthcare directions to boost patient loyalty and healthcare satisfaction [58].

Hospital operations gain efficiency and provide both lower administrative workload and superior patient interaction because they use artificial intelligence. Hospital resource management receives a transformational change from AI through its ability to generate predictive analytics that predicts both patient demands and optimizes essential hospital assets [59]. The predictive power of AI focuses on two main uses: AI systems examine historical records and present-day patient movements to forecast upcoming patient acceptances and hospital bed use. Hospitals can optimize their distribution of beds together with ventilators and medical staff resources because of this capability [60].

Medical institutions can utilize AI predictive models to enhance pharmaceutical and medical supply inventory with optimal allocation which prevents inventory shortages or excessive stock levels. Hospital administrators need this approach to manage their stock of vital hospital materials including personal protective equipment (PPE) and blood supplies and medical instruments [61]. The decision support system powered by AI enables hospitals to process ER patients through triage by severity levels therefore patients with critical conditions receive urgent care and resources get maximized. Predictive analytics enables healthcare institutions to decrease operational shortcomings while decreasing medical costs and upgrading patient healing results [62].

Healthcare institutions process huge volumes of confidential patient information which makes them attractive targets for cyberattacks and cases of fraud. Through AI technology organizations can identify cases of fraud as well as improve their cybersecurity infrastructure. Healthcare organizations leverage AI to spot insurance scams by examining patterns of billing activity and discontinuous claims together with drug prescriptions and billing duplicates to lower expenses while upholding compliance standards [63]. Machine learning cybersecurity systems operate through hospital

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

networks to identify unusual network actions that lead to preventing hackers from accessing sensitive patient records. Through automation AI enables healthcare organizations to automate assessment of privacy risks and detect vulnerabilities which helps organizations meet their data privacy standards (e.g. HIPAA and GDPR). Healthcare providers who deploy AI-security solutions protect patient information from breaches while they simultaneously stop fraud attempts and meet legal standards [64].

The utilization of AI-powered tools enables higher patient involvement through custom-made health services together with time-sensitive wellness support. Through AI-driven personalized patient portals people receive individualized health recommendations and appointment notifications and prescription monitoring which keeps them abreast of their medical journey. Virtual health assistant systems built with AI capabilities allow patients to track their symptoms along with providing initial diagnosis results while advising when medical care becomes necessary [65]. Telemedicine solutions with AI capabilities allow remote consultations which decreases patient numbers at hospitals and clinics. AI-supported voice recognition tools enable medical staff to report patients' records through speech automatically while also improving real-time accuracy of clinical documentation [66].

The implementation of AI in patient engagement approaches enables healthcare institutions to enhance both patient contentment levels and therapeutic compliance along with better medical results. One of the main barriers for AI integration into healthcare operations is the difficulty of combining old data systems with new AI technology because legacy software systems usually do not interact with AI effectively. Some medical staff resists AI implementation because they fear technological dependency alongside staff reduction as well as regulatory hurdles and technology dependency [67]. AI-powered decisions affecting hospital operations and the handling of billing and patient care ordering need to follow ethical rules to maintain non-biased administration and equal resource distribution. The costs required to deploy AI systems become expensive at the start particularly for both small healthcare facilities and rural locations. Costs at the beginning stage prove higher than the long-term advantages [68].

AI system transformation of healthcare focuses on two main functions whereby it automates administrative work and optimizes resource distribution and fosters better safety measures and improved patient services. AI technology advancement for healthcare management systems will create enhanced operational efficiency together with lower operation costs and better patient care outcomes AI-driven healthcare operations require us to resolve data integration problems together with regulatory requirements while handling ethical matters so the systems can succeed. Hospital management has an opportunity to transform through AI development that will enhance healthcare

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

systems while creating patient-focused operations with better resilience [69].

ETHICAL AND REGULATORY CHALLENGES OF AI IN HEALTHCARE

The continuous technological advancement of Artificial Intelligence (AI) in healthcare creates serious problems regarding ethics and regulatory matters. Multiple advantages exist in healthcare from utilizing AI methods but health systems face fundamental problems involving data protection along with prejudice in their frameworks and decision-making processes that require institutional governance [70]. The deployment of AI in healthcare requires immediate intervention to address ethical, safety and fairness issues that support public trust in AI-based medical solutions. AI healthcare applications in medical settings present four major ethical concerns about patient information security together with algorithmic biases along with decision-making clarity and physician involvement during clinical choices [71].

The extensive patient datasets used by AI systems contain electronic health records (EHRs) together with genomic information and medical imaging. Data security needs strong protection because it safeguards against breaches of data and unauthorized procedures and unapproved data uses. Healthcare organizations face difficulties in achieving compliance with data protection standards under HIPAA and GDPR because they need to navigate various healthcare systems across the sector [72]. The distribution of biases throughout training data influences AI models to regenerate those biases which subsequently leads to unbalanced healthcare results. An AI model trained primarily on one demographic group will deliver inaccurate diagnosis results to populations outside this initial base. The elimination of bias in AI systems demands datasets that represent all patient populations combined with permanent inspections and audits of machine learning models [73].

The current lack of clarity about AI-driven healthcare solutions makes their decision-making internal processes inaccessible to healthcare professionals. XAI works toward developing transparent AI systems which explain their computational reasoning to permit clinicians to evaluate and trust these AI system recommendations. Automated medical decisions that cause errors or misdiagnoses create complex situations for determining who bears responsibility. Healthcare providers or AI developers or organizations that implement AI systems should bear responsibility for such decisions. Legislative standards and ethical principles play an essential role for defining account responsibilities and lowering possible dangers [74].

Governments and medical organizations continue to shape the regulatory framework for healthcare AI through processes which ensure governance while giving approval to and overseeing AI applications. Regulators encounter primary hurdles in their work to manage AI algorithms through two major aspects: First is the approval process for AI algorithms and second is the ongoing need for

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

standardized AI algorithm assessments [75]. The U.S. Food and Drug Administration (FDA) together with European Medicines Agency (EMA) along with World Health Organization (WHO) are developing industry standards for medical AI tools but these efforts remain unsupported by a single worldwide regulatory foundation [76].

The deployment of AI-driven healthcare applications needs to follow medical guidelines together with all necessary healthcare regulatory standards. AI developers need to implement security measures for their models to achieve medical standards as well as ethical guidelines while meeting regulatory requirements during the approval process with governing bodies. Medical healthcare exists as a worldwide industry that depends on AI systems using international data sources [77]. Diverse data privacy standards between nations creates major obstacles for implementing AI throughout different borders as well as for sharing data internationally. Widespread adoption of AI systems requires them to fulfill all legal requirements present in different jurisdictions [78].

After receiving regulatory approval AI systems need permanent observation accompanied by system inspection to confirm their extended operational potency and protection status. The responsible body must create protocols for monitoring AI systems throughout their market life cycle while developing testing methodology for real-world implementation and maintaining constant reviews of their performances [79]. The development of ethical AI frameworks requires a combined effort between governments and healthcare organizations together with AI developers who establish thorough ethical codes which put patient safety along with fairness and accountability at the top. AI developers should dedicate their efforts to developing interpretable AI models which enable clinicians to review and confirm the validity of AI-driven suggestions [80].

The training data for AI models should contain diverse representation of patient populations because this approach will reduce biases while promoting equal healthcare treatment across the entire population. Organizations within healthcare need to allocate funds to buy sophisticated encryption systems alongside data anonymization methods together with cybersecurity protocols for safeguarding patient information from unauthorized breaches and malicious use [81]. AI developers can use regulated testing environments named regulatory sandboxes to enhance their artificial intelligence models' development process before commercial release. The procedure enables both the examination of AI operational efficiency and regulatory conformity testing and safety assessments prior to deployment in public programs [82].

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

THE FUTURE OF AI IN HEALTHCARE: OPPORTUNITIES AND CHALLENGES

Artificial Intelligence (AI) applications in healthcare continue to advance quickly because they transform three areas: diagnostic procedures, medical treatments, individual healthcare delivery, and hospital management practices. The current evidence shows that Artificial Intelligence successfully optimizes operations and minimizes expenses while delivering better patient healthcare results [83]. The healthcare industry will achieve its future potential through effective management of technological progress alongside ethical matters and regulatory compliance and system implementation difficulties. AI development will require investigation into extracting maximum advantages from AI tools together with risk mitigation and performance restriction management strategies [84].

Medical practices alongside patient care will undergo complete transformations through AI developments in the future because these discoveries will speed drug discovery processes which will decrease treatment development expenses and time. Advanced AI systems examine substantial biological datasets to perform the following functions: Advanced artificial intelligence models will transform precision medicine by developing targeted individual treatment plans [85]. Modern healthcare imaging systems using artificial intelligence capabilities produce better results and reduce expenses when analyzing conditions particularly affecting cancer together with cardiovascular diseases and neurological disorders. Implementation of telemedicine services combined with AI-powered virtual health assistants will rise at an increasing rate to serve people in rural locations and underserved communities [86]. Future innovations may include:

AI accessibility together with cost-effectiveness and operational efficiency becomes possible through reduced requirement of physical healthcare appointments. Robotic-assisted surgery together with AI-based rehabilitation technology will experience growth while the future shows potential for AI-improved robotic surgical systems to boost accuracy while minimizing operation dangers. Rehabilitation robots equipped with AI technology help stroke patients along with patients suffering from injuries and requiring surgical recovery [87]. Advanced technologies will create better surgical achievements while decreasing patient recovery periods alongside better health-related wellness for patients. Multiple barriers hinder the extensive use of AI healthcare across different sectors despite clearly shown benefits [88].

AI brings unavoidable ethical problems to healthcare which include the protection of patient privacy and protection of data and the possibility of biased algorithms. The main difficulties revolve around healthcare organizations continuing to use outdated software systems and insufficient infrastructure that prevents them from adopting AI. AI adoption necessitates all medical organizations must enhance

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

their electronic health records (EHR) systems to enable AI system integration. Medically trained personnel need education about using AI tools during their work sessions [89]. The process of making healthcare providers accept the integration of Artificial Intelligence into their work. Conducting successful implementation demands infrastructure spending and training staff together with the development of easy-to-use AI solutions. Before medical staff can utilize AI models in their clinical work AI models must obtain approval from healthcare regulatory bodies [90].

The safe implementation of AI solutions in healthcare depends on research collaboration with providers and policymakers together with developers who seek to establish equitable solutions. The future trajectory of global healthcare will have the potential to transform through AI as the technology develops into a system that delivers maximum efficiency together with widespread accessibility and patient-focused care.

CONCLUSION

Artificial Intelligence (AI) shapes current healthcare through strategic advancements in all aspects from diagnostic technologies to treatments and hospital automation and pharmaceutical research and delivery of medical services to patients. Medicine benefits from AI implementation through practical analytics assisted by robots and customized treatments that combine with automated hospital systems to increase operational efficiency while saving money and improving patient health results. Medical institutions leverage this powerful tool because it helps them analyze extensive medical data to improve decision support and maximize resource efficiency in healthcare.

A number of difficult challenges exist in the process of integrating AI systems within healthcare settings despite its substantial potential benefits. Patient privacy and algorithm bias together with transparency issues form the core concerns that face ethical implementation of healthcare systems. The implementation of AI decision systems for diagnosis and treatment planning faces legal issues regarding liability and accountability because of which clear regulatory standards become necessary. Organizations must deal with regulatory standards and model standardization because AI systems require formal approval processes before they can be used in medical facilities. Implementation expenses along with reluctance to change among medical personnel hamper the speed of AI adoption in healthcare settings.

AI technology evolution will make its leading role in disease detection enhancement and treatment method revolution and hospital operational efficiency and telemedicine solutions expansion more powerful. AI healthcare systems implemented with proper security measures will transform medical care into more accurate and patient-focused healthcare services which operate with increased speed. The potential benefits of AI in healthcare will become reality through our capacity to manage

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

technological difficulties along with proper medical practice integration.

Abstract

REFERENCES

[1]. Smith AA, Li R, Tse ZTH (2023) Reshaping healthcare with wearable biosensors. Sci Rep 13(1):4998

[2]. Zhou, H.; Li, Y.; Wu, W. Aptamers: Promising Reagents in Biomedicine Application. Adv. Biol. 2024, 2300584

[3]. Park, Y.; Hong, M.-S.; Lee, W.-H.; Kim, J.-G.; Kim, K. Highly Sensitive Electrochemical Aptasensor for Detecting the VEGF165 Tumor Marker with PANI/CNT Nanocomposites. Biosensors (Basel) 2021, 11 (4), 114.

[4]. Vacek, J.; Zatloukalová, M.; Dorcák,˘ V.; Cifra, M.; Futera, Z.; Ostatná, V. Electrochemistry in Sensing of Molecular Interactions of Proteins and Their Behavior in an Electric Field. Microchimica Acta 2023, 190 (11), 442.

[5]. Smith M, Sattler A, Hong G et al. (2021) From Code to Bedside: Implementing Artificial Intelligence Using Quality Improvement Methods. J Gen Intern Med 36:1061–1066. https://doi.org/10.1007/s11606-020-06394-w

[6]. Stahl BC, Antoniou J, Bhalla N et al. (2023) A systematic review of artificial intelligence impact assessments. Artif Intell Rev 56:12799–12831. https://doi.org/10.1007/s10462-023-10420-8

[7]. Lee D, Yoon SN. Application of Artificial Intelligence-Based Technologies in the Healthcare Industry: Opportunities and Challenges. Int J Environ Res Public Health. 2021;18(1):271. https://doi.org/10.3390/ijerph18010271

[8]. Lodhi SK. Synaptic Harmonies: Applying Graph Coloring Algorithms to Mental Health AI Systems. Global Journal of Emerging AI and Computing. 2025 Jan 26; 1(1):83-91.

[9]. Pezzo MV, Beckstead JW. Patients prefer artificial intelligence to a human provider, provided the AI is better than the human: A commentary on Longoni, Bonezzi and Morewedge (2019). Judgment and Decision Making. Cambridge University Press; 2020; 15(3):443–5. https://doi.org/10.1017/S1930297500007221

[10]. Brown, A. N., & Patel, D. (2017). Future Prospects of AI in Personalized Medicine. Journal of Personalized Medicine, 7(4), 15

[11]. Kleinberg J, Lakkaraju H, Leskovec J, Ludwig J, Mullaina- than S. Human decisions and machine predictions. Q J Econ. 2018; 133:237–93. https://doi.org/10.1093/qje/qjx032

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[12]. Edwards V. Slave to the algorithm: Why a right to an explanation is probably not the remedy you are looking for. Duke Law Tech- nol Rev. https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/dltr16&section=3

[13]. Binns R. Fairness in machine learning: Lessons from political philosophy. In: Friedler SA, Wilson C, editors. Proceedings of the 1st conference on fairness, accountability and transparency. PMLR; 2018. p. 149–59

[14]. Selbst AD, Boyd D, Friedler SA, Venkatasubramanian S, Ver- tesi J. Fairness and abstraction in sociotechnical systems. In: Proceedings of the conference on fairness, accountability, and transparency. New York, USA. Association for Computing Machinery; 2019. https://doi.org/10.1145/3287560.3287598

[15]. Wong P-H. Democratizing algorithmic fairness. Philos Technol. 2020; 33:225–44. https://doi.org/10.1007/s13347-019-00355-w.

[16]. Abebe R, Barocas S, Kleinberg J, Levy K, Raghavan M, Robin- son DG. Roles for computing in social change. In: Proceedings of the 2020 conference on fairness, accountability, and transpar- ency. New York, USA. Association for Computing Machinery; 2020. https://doi.org/10.1145/3351095.3372871

[17]. Bærøe K, Gundersen T, Henden E, Rommetveit K. Can medical algorithms be fair? Three ethical quandaries and one dilemma. BMJ Health Care Inform. 2022. https://doi.org/10.1136/bmjhci-2021-100445.

[18]. World Medical Association. Declaration of Geneva. World Medi- cal Association; 1983 14. Ueda D, Shimazaki A, Miki Y. Technical and clinical overview of deep learning in radiology. Jpn J Radiol. 2019; 37:15–33. https://doi.org/10.1007/s11604-018-0795-3.

[19]. Yuba M, Iwasaki K. Systematic analysis of the test design and performance of AI/ML-based medical devices approved for triage/detection/diagnosis in the USA and Japan. Sci Rep. 2022; 12:16874. https://doi.org/10.1038/s41598-022-21426-7.

[20]. Samad A, Jamal A. Transformative Applications of ChatGPT: A Comprehensive Review of Its Impact across Industries. Global Journal of Multidisciplinary Sciences and Arts. 2024;1(1):26-48.

[21]. Coeckelbergh M. Health care, capabilities, and AI assistive technologies. Ethical Theory Moral Pract 2010; 13: 181-190.

[22]. Zeb S, Nizamullah FN, Abbasi N, Qayyum MU. Transforming Healthcare: Artificial Intelligence's Place in Contemporary Medicine. BULLET: Jurnal Multidisiplin Ilmu. 2024;3(4):592385.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[23]. Naveed MA. Transforming healthcare through artificial intelligence and machine learning. PJHS 2023; 01. Impact of AI and foundation models 2177 Am J Transl Res 2024;16(6):2166-2179

[24]. Panch T, Szolovits P and Atun R. Artificial intelligence, machine learning and health systems. J Glob Health 2018; 8: 020303.

[25]. Liu J, Kong X, Xia F, Bai X, Wang L, Qing Q and Lee I. Artificial intelligence in the 21st century. IEEE Access 2018; 6: 34403-34421.

[26]. Zahlan A, Ranjan RP and Hayes D. Artificial intelligence innovation in healthcare: literature review, exploratory analysis, and future research. Technol Soc 2023; 74: 102321.

[27]. Tran BX, Vu GT, Ha GH, Vuong QH, Ho MT, Vuong TT, La VP, Ho MT, Nghiem KP, Nguyen HLT, Latkin CA, Tam WWS, Cheung NM, Nguyen HT, Ho CSH and Ho RCM. Global evolution of research in artificial intelligence in health and medicine: a bibliometric study. J Clin Med 2019; 8: 360.

[28]. Jones LD, Golan D, Hanna SA and Ramachandran M. Artificial intelligence, machine learning and the evolution of healthcare: a bright future or cause for concern? Bone Joint Res 2018; 7: 223-225

[29]. Bacha A. Unveiling Frontiers: Hybrid Algorithmic Frameworks for AI-Driven Mental Health Interventions. AlgoVista: Journal of AI and Computer Science.;2(1):1-8.

[30]. Sharma B, Sille R, Bansal A and Chaturvedi SK. A comprehensive review on AI techniques for healthcare. In: Revolutionizing Healthcare through Artificial Intelligence and Internet of Things Applications. IGI Global; 2023. pp. 187- 209.

[31]. Kumar S, Kumar S, Shiwlani A. Machine Learning for Labor Optimization: A Systematic Review of Strategies in Healthcare and Logistics. Pakistan Social Sciences Review. 2025 Mar 31; 9(1):631-51.

[32]. Zhu S, Gilbert M, Chetty I, The SF. landscape of FDA-approved artifcial intelligence/machine learning-enabled medical devices: an analysis of the characteristics and intended use. Int J Med Inform. 2021. https://doi.org/10.1016/j.ijmedinf.2022.104828.

[33]. Kelly BS, Judge C, Bollard SM, Clifford SM, and Healy GM, and Aziz A, et al. Radiology artifcial intelligence: a systematic review and evaluation of methods (RAISE). Eur Radiol. 2022; 32:7998– 8007. https://doi.org/10.1007/s00330-022-08784-6

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[34]. Zeb S, Nizamullah FN, Abbasi N, Fahad M. AI in healthcare: revolutionizing diagnosis and therapy. International Journal of Multidisciplinary Sciences and Arts. 2024 Aug 17;3(3):118-28.

[35]. Esmaeilzadeh P. Use of AI-based tools for healthcare purposes: a survey study from consumers' perspectives. BMC Med Inform Decis Mak. 2020;20(1):170. Published 2020 Jul 22. https://doi.org/10.1186/s12911-020-01191-1.

[36]. Khullar D, Casalino LP, Qian Y, Lu Y, Krumholz HM, Aneja S. Perspectives of patients about Artificial Intelligence in Health Care. JAMA Netw Open. 2022;5(5):e2210309. https://doi.org/10.1001/jamanetworkopen.2022.10309.

[37]. D. Kim, T. Lee, S. Kim, B. Lee, H. Y. Youn, Adaptive packet scheduling in iot environment based on q-learning, Procedia Computer Science 141 (2018) 247–254.

[38]. Jamwal A, Agrawal R, and Sharma M, Giallanza A. Industry 4.0 technologies for manufacturing sustainability: A systematic review and future research directions. Applied Sciences. 2021 Jun 20; 11(12):5725.

[39]. Zeb S, Lodhi SK. AI and Cybersecurity in Smart Manufacturing: Protecting Industrial Systems. American Journal of Artificial Intelligence and Computing. 2025 Apr 7;1(1):1-23.

[40]. Y. Liang, T. Cui, Y. Cao, H. Tang, An effective resource scheduling model for edge cloud oriented aiot, Concurrency and Computation: Practice and Experience 34 (5) (2022) e6720.

[41]. H. Shi, Q. Li, Edge computing and the internet of things on agricultural green productivity, The Journal of Supercomputing (2022) 1–23.

[42]. O. Vermesan, J. E. Martinsen, A. Kristoffersen, R. Bahr, R. O. Bellmann, T. Hjertaker, J. Breiland, K. Andersen, H. E. Sand, P. Rahmanpour, et al., Optimisation of soybean manufacturing process using real-time artificial intelligence of things technology, Artificial Intelligence for Digitising Industry-Applications (2022) 301.

[43]. Asai A, Koseki J, Konno M, Nishimura T, Gotoh N, Satoh T, Doki Y, Mori M and Ishii H: Drug discovery of anticancer drugs targeting methylenetetrahydrofolate dehydrogenase 2. Heliyon 4: e01021, 2018.

[44]. Spangler S, Wilkins AD, Bachman BJ, Nagarajan M, Dayaram T, Haas P, Regenbogen S, Pickering CR, Comer A, Myers JN et al: Automated hypothesis generation based on mining scientific literature. KDD'14: Proceedings of the 20th ACM SIGKDD international conference on Knowledge discovery and data mining: 1877-1886, 2014.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[45]. Doyle-Lindrud S: Watson will see you now: A supercomputer to help clinicians make informed treatment decisions. Clin J Oncol Nurs 19: 31-32, 2015

[46]. Tojo A: Clinical sequencing in leukemia with the assistance of artificial intelligence. Rinsho Ketsueki 58: 1913-1917, 2017 (In Japanese).

[47]. Esteva A, Kuprel B, Novoa RA, Ko J, Swetter SM, Blau HM and Thrun S: Dermatologist-level classification of skin cancer with deep neural networks. Nature 542: 115-118, 2017.

[48]. Toratani M, Konno M, Asai A, Koseki J, Kawamoto K, Tamari K, Li Z, Sakai D, Kudo T, Satoh T, et al: A convolutional neural network uses microscopic images to differentiate between mouse and human cell lines and their radioresistant clones. Cancer Res 78: 6703-6707, 2018.

[49]. Bacha A, Abid N. AI-Driven Drug Discovery: Revolutionizing the Pharmaceutical Industry and Reducing Time to Market. Global Journal of Machine Learning and Computing. 2025 Jan 23;1(1):1-4.

[50]. Yanagisawa K, Toratani M, Asai A, Konno M, Niioka H, Mizushima T, Satoh T, Miyake J, Ogawa K, Vecchione A, et al: Convolutional neural network can recognize drug resistance of single cancer cells. Int J Mol Sci 21: 3166, 2020.

[51]. Tanos R, Tosato G, Otandault A, Al Amir Dache Z, Pique Lasorsa L, Tousch G, El Messaoudi S, Meddeb R, Assaf MD, Ychou M, et al: Machine learning-assisted evaluation of circulating DNA quantitative analysis for cancer screening. Adv Sci (Weinh) 7: 2000486, 2020.

[52]. Im YR, Tsui DWY, Diaz LA Jr and Wan JCM: Next-generation liquid biopsies: Embracing data science in oncology. Trends Cancer 7: 283-292, 2021.

[53]. Harada Y and Shimizu T: Impact of a Commercial Artificial Intelligence-Driven Patient Self-Assessment Solution on Waiting Times at General Internal Medicine Outpatient Departments: Retrospective Study. JMIR Med Inform 8: e21056, 2020.

[54]. Litjens G, Kooi T, Bejnordi BE, Setio AAA, Ciompi F, Ghafoorian M, van Der Laak JA, van GinnekenB and SánchezCI: A survey on deep learning in medical image analysis. Med Image Anal 42: 60-88, 2017.

[55]. Khosravi P, Kazemi E, Imielinski M, Elemento O and Hajirasouliha I: Deep convolutional neural networks enable discrimination of heterogeneous digital pathology images. EBioMedicine 27: 317-328, 2018.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[56]. Meyer A, Zverinski D, Pfahringer B, Kempfert J, Kuehne T, Sündermann SH, Stamm C, Hofmann T, Falk V and Eickhoff C: Machine learning for real-time prediction of complications in critical care: A retrospective study. Lancet Respir Med 6: 905-914, 2018.

[57]. Saeidi H, Opfermann JD, Kam M, Raghunathan S, Leonard S and Krieger A: A confidence-based shared control strategy for the smart tissue autonomous robot (STAR). Rep US 2018: 1268-1275, 2018.

[58]. Brown N, Cambruzzi J, Cox PJ, Davies M, Dunbar J, Plumbley D, Sellwood MA, Sim A, Williams-Jones BI, Zwierzyna M and Sheppard DW: Big data in drug discovery. Prog Med Chem 57: 277-356, 2018.

[59]. Vélez-Guerrero MA, Callejas-Cuervo M and Mazzoleni S: Artificial intelligence-based wearable robotic exoskeletons for upper limb rehabilitation: A review. Sensors (Basel) 21: 2146, 2021.

[60]. Comendador B, Francisco B, Medenilla J, Nacion S and Serac T: Pharmabot: A pediatric generic medicine consultant chatbot. J Automat Control Eng 3: 137-140, 2015.

[61]. Wong V, Rosenbaum S, Sung W, Kaplan RM, Bott N, Platchek T, Milstein A and Shah NR: Caring for caregivers: bridging the gap between family caregiving policy and practice. NEJM Catal Innov Care Deliv 2: 2021.

[62]. Yasuo N and Sekijima M: Improved method of structure-based virtual screening via interaction-energy-based learning. J Chem Inf Model 59: 1050-1061, 2019.

[63]. Wallach I, Dzamba M and Heifets A: AtomNet: A deep convolu- tional neural network for bioactivity prediction in structure-based drug discovery. arXiv: 1510.02855, 2015.

[64]. Stork C, Chen Y, Šícho M and Kirchmair J: Hit dexter 2.0: Machine-learning models for the prediction of frequent hitters. J Chem Inf Model 59: 1030-1043, 2019.

[65]. Wójcikowski M, Zielenkiewicz P and Siedlecki P: Open drug discovery toolkit (ODDT): A new open-source player in the drug discovery field. J Cheminform 7: 26, 2015.

[66]. Rifaioglu AS, Nalbat E, Atalay V, Martin MJ, Cetin-Atalay R and Doğan T: DEEPScreen: High performance drug-target inter- action prediction with convolutional neural networks using 2-D structural compound representations. Chem Sci 11: 2531-2557, 2020.

[67]. Xu Y, Ma J, Liaw A, Sheridan RP and Svetnik V: Demystifying multitask deep neural networks for quantitative structure-activity relationships. J Chem Inf Model 57: 2490-2504, 2017.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[68]. Awale M and Reymond JL: Polypharmacology Browser PPB2: Target prediction combining nearest neighbors with machine learning. J Chem Inf Model 59: 10-17, 2019.

[69]. Duvenaud DK, Maclaurin D, Iparraguirre J, Bombarell R, Hirzel T, Aspuru-Guzik A and Adams RP: Convolutional networks on graphs for learning molecular fingerprints. In: Advances in neural information processing systems 28. NIPS Foundation, Montreal 2: 2224-2232, 2015.

[70]. Putin E, Asadulaev A, Ivanenkov Y, Aladinskiy V, SanchezLengeling B, Aspuru-Guzik A and Zhavoronkov A: Reinforced adversarial neural computer for de novo molecular design. J Chem Inf Model 58: 1194-1204, 2018.

[71]. Olivecrona M, Blaschke T, Engkvist O and Chen H: Molecular de-novo design through deep reinforcement learning. J Cheminform 9: 48, 2017.

[72]. Mayr A, Klambauer G, Unterithiner T and Hochreiter S: DeepTox: Toxicity prediction using deep learning. Front Environ Sci 3: 80, 2016.

[73]. Steiner S, Wolf J, Glatzel S, Andreou A, Granda JM, Keenan G, Hinkley T, Aragon-Camarasa G, Kitson PJ, Angelone D and Cronin L: Organic synthesis in a modular robotic system driven by a chemical programming language. Science 363: eaav2211, 2019.

[74]. Coley CW, Rogers L, Green WH and Jensen KF: SCScore: Synthetic complexity learned from a reaction corpus. J Chem Inf Model 58: 252-261, 2018.

[75]. Antunes DA, Devaurs D and Kavraki LE: Understanding the challenges of protein flexibility in drug design. Expert Opin Drug Discov 10: 1301-1313, 2015

[76]. Uehara S and Tanaka S: AutoDock-GIST: Incorporating thermo- dynamics of active-site water into scoring function for accurate protein-ligand docking. Molecules 21: 1604, 2016

[77]. Abbasi N, Nizamullah FN, Zeb S. Ai in healthcare: Using cutting-edge technologies to revolutionize vaccine development and distribution. JURIHUM: Jurnal Inovasi dan Humaniora. 2023 Jun 14;1(1):17-29.

[78]. Walonoski J, Kramer M, Nichols J, Quina A, Moesel C, Hall D, Duffett C, Dube K, Gallagher T and McLachlan S: Synthea: An approach, method, and software mechanism for generating synthetic patients and the synthetic electronic health care record. J Am Med Inform Assoc 25: 230-238, 2018.

[79]. Choi E, Biswal S, Malin B, Duke J, Stewart WF and Sun J: Generating multi-label discrete patient records using generative adversarial networks. PMLR 68: 286-305, 2017.

ISSN : 3079-5761
Volume 1, Number 2, 2025
https://doi.org/10.70445/gtst.1.2.2025.23-48

[80]. Linardatos P, Papastefanopoulos V and Kotsiantis S: Explainable AI: A Review of Machine Learning Interpretability Methods. Entropy (Basel) 23: 18, 2021.

[81]. Russo S, Jongerius C, Faccio F, et al. Understanding patients' preferences: a systematic review of Psychological Instruments used in patients' preference and decision studies. Value Health. 2019;22(4):491–501. https://doi.org/10.1016/j.jval.2018.12.007.

[82]. Suárez A, Díaz-Flores García V, Algar J, Gómez Sánchez M, Llorente de Pedro M, Freire Y (2024) Unveiling the ChatGPT phenomenon: Evaluating the consistency and accuracy of endodontic question answers. Int Endod J 57:108–113. https://doi.org/10.1111/iej.13985

[83]. Lodhi SK, Hussain I, Gill AY. Artificial intelligence: Pioneering the future of sustainable cutting tools in smart manufacturing. BIN: Bulletin of Informatics. 2024; 2(1):147-62.

[84]. Sui A, Sui W, Liu S, Rhodes R (2023) Ethical considerations for the use of consumer wearables in health research. Digital Health 9:20552076231153740

[85]. Sunarti S, Rahman FF, Naufal M, Risky M, Febriyanto K, Masnina R (2021) Artificial intelligence in healthcare: opportunities and risk for future. Gac Sanit 35(Supplement 1):S67–S70. https://doi.org/10.1016/j.gaceta.2020. 12.019

[86]. Tahri Sqalli M, Aslonov B, Gafurov M, Nurmatov S (2023) Humanizing AI in medical training: ethical framework for responsible design. Front Artif Intell 6:1189914

[87]. Taka AM (2023) A deep dive into dynamic data flows, wearable devices, and the concept of health data, International Data Privacy Law, Volume 13, Issue 2, May 2023, Pages 124–140. https://doi.org/10.1093/idpl/ipad007

[88]. Tang L, Li J, Fantus S (2023) Medical artificial intelligence ethics: A systematic review of empirical studies. Digital Health 9, https://doi.org/10.1177/20552076231186064

[89]. Thierer AD (2015) The Internet of Things and Wearable Technology: Addressing Privacy and Security Concerns without Derailing Innovation. Rich J L Tech 21(6). Available at: https://scholarship.richmond.edu/jolt/vol21/iss2/4

[90]. Tomašev N, Glorot X, Rae JW et al. (2019) A clinically applicable approach to continuous prediction of future acute kidney injury. Nature 572:116–119. https://doi.org/10.1038/s41586019-1390-1