ISSN: 2583-9888
DOI: doi.org/10.51219/JAIMLD/mahnoor-mughal/362

URF PUBLISHERS
connect with research world

Journal of Artificial Intelligence, Machine Learning and Data Science

https://urfpublishers.com/journal/artificial-intelligence

Vol: 2 & Iss: 2

Review

Revolutionizing Healthcare Delivery: Evaluating the Impact of Google's Gemini AI as a Virtual Doctor in Medical Services

Mohammad Irshad[1*], Dr, Muhammad Iftikhar Hanif[2], Dr. Maqbool Khan[3], Nisa Irshad[4], Noor-Ul-Huda Waseem[5], Shafin I Chaudhri[6], Safa N Chaudhri[7], Mahnoor Mughal, Ahmad Tashfeen[8], Dr. Mawra Iqbal[9] and Aneeqa Mahmood[10]

[1]AI/ML Computational Science, Accenture, New York City, New York, USA

[2]Newcastle University Medicine Malaysia (NUMed Malaysia), Johor, Malaysia

[3]Assistant Professor, School of Computing Sciences, Pak-Austria Fachhochschule: Institute of Applied Sciences and Technology, Haripur, KPK, Pakistan

[4]Student, High School West; Half Hollow Hills School District New York

[5]St. George's University School of Medicine, St. George's, Grenada

[6]Student, Rutgers Preparatory School, Somerset, New Jersey, USA

[7]New York Institute of Technology, Northern Boulevard, Valentines Ln, Old Westbury, New York, USA

[8]Technology Development Director, Genai-trainings.com LLC, New York City, New York, USA

[9]MBBS - Akhtar Saeed Medical and Dental College Pakistan

[10]Australian Colloge for Applied Psychology (ACAP) University College Australia

Citation: Irshad M, et al. Revolutionizing Healthcare Delivery: Evaluating the Impact of Google's Gemini AI as a Virtual Doctor in Medical Services. J Artif Intell *Mach Learn & Data Sci 2024*, 2(2), 1618-1625. DOI: doi.org/10.51219/JAIMLD/mahnoor-mughal/362

Received: 24 November, 2024; **Accepted:** 10 December, 2024; **Published:** 13 December, 2024

***Corresponding author:** Irshad Mohammad, AI/ML Computational Science, Accenture, New York City, New York, USA

ABSTRACT

This paper evaluates the impact of an emerging AI technology particularly, Google's Gemini, as a virtual doctor in medical services. Google's Gemini is a cutting-edge, multimodal designed to generate, process, and understand a variety of information types, including text, images, audio and video. Our study focuses on answering how Gemini AI plays a vital role in the healthcare industry and carefully identifying its strengths and weaknesses. We did a deep analysis comparing Gemini AI to all of its contemporaries through descriptive and qualitative research. We validated our findings based on a comprehensive literature review to evaluate the contents accuracy and relevance. We also focused on the application of Gemini AI within the healthcare industry, specifically how it pertains to attributes like patient care and the Internet of Medical Things (IoMT). Our study uses LaMDA: Language Models for Dialog Applications as a reference model which contains over 137B parameters to generate insights for the various applications of AI in the healthcare industry. Our study concludes that Gemini AI holds immense potential in revolutionizing the healthcare industry by acting as a virtual doctor by illustrating the model's capabilities in contributing to the healthcare industry.

Keywords: Gemini; Healthcare; Large Language Model; Natural Language Processing; Internet of Medical Things; ChatGPT; Virtual Doctor

1. Introduction

A significant advancement in artificial intelligence, particularly for natural language processing (NLP), is represented by Generative Pre-trained Transformers (GPT)[1]. GPT-1, which OpenAI released in 2018, opened the door for a number of ever more complex models. GPT-2 and GPT-3 substantially improved robots' comprehension and production of human-like text[2]. As the models improved with each iteration, they were able to handle a greater variety of language tasks and better understand context, which laid a solid basis for future developments in AI.

Expanding upon the successes of GPT models, Google's 2023 release of Gemini AI is a significant advancement as it applies the concepts of large-scale language models to more focused tasks[3]. While different from OpenAI's GPT series, Gemini AI expands on its innovations by utilizing Google's massive amount of data and processing capacity.The transition from GPT to Gemini AI demonstrates how AI technologies have developed from basic text understanding to specific applications. With its sophisticated machine learning and natural language processing powers, Gemini AI has the rare potential to completely transform the healthcare industry[4,5]. It makes highly individualized patient care possible, streamlines the delivery of healthcare, and significantly boosts the effectiveness of several medical devices, like IoMT[6]. Because of the risks associated with AI technologies, despite their many capabilities, they are closely monitored. These hazards include, but are not limited to, problems like patient privacy, data leaks, and inadvertent discrimination brought on by AI's lack of empathy[7].It is imperative to understand why these concerns are brought forth and what they mean for the industry as a whole, because there are clear valuable benefits brought forth by artificial intelligence bots such as Gemini AI[8]. AI has the power to revolutionize medicine, making ongoing research essential to harness its potential for good.

2. Materials And Methods

This paper utilizes artificial intelligence chatbots to procure information on the utilization of artificial intelligence (AI) in the healthcare industry, with a focal point on Google's Gemini AI that was released in December 2023. The two chatbots that were used to generate content were Google's Gemini AI and OpenAI's ChatGPT-4, a subscription-based 4th generation chatbot. The paper is divided into two sections: the evaluation of Gemini AI and its features compared to competitive AI models and then the overall application of artificial intelligence on the healthcare industry with a focus on the improvements brought by the various advantages of Gemini AI. All material received through the use of the chatbots were verified through the use of scientific literature review. Information received by Gemini AI or ChatGPT-4 were not cited to avoid confusion throughout the paper but when validated through the literature review, the scientific literature was properly cited.

Gemini AI was analyzed against its various competitors to see whether it was the best chatbot for medical needs. This was done through three major parts.

1. Recognizing the unique advantages brought through the use of Gemini AI that allows it to have an edge over opposing AI bots.
2. Evaluating Gemini AI's impact on the healthcare landscape through a well-defined research methodology.
3. Comparing the dimensions of Gemini AI across other foundational models.

The chatbots were mainly used to produce general applications of artificial intelligence to the healthcare industry. Gemini AI is a large language model (LLM) that utilizes a branch of artificial intelligence known as natural language processing (NLP), so all benefits provided through the use of any artificial intelligence bot that is either a LLM or is using NLP can be applied to Gemini AI as well. This is important because much of the current literature is not focused on Gemini AI specifically but rather AI as a whole, so literature that pertains to the use of LLM/NLP in the medical workplace can also be used to evaluate how Gemini AI would fare. To generate information, we asked the chatbots Gemini AI and ChatGPT-4 these three questions and regenerated responses to provide more concise information. Information with the most literature support was incorporated in this paper.

1. What are the roles LLM/NLP can play in the healthcare industry as a virtual doctor?
2. Give a list of Internet of Medical Things (IoMT) devices and how they would be improved through the use of artificial intelligence
3. How will Gemini AI affect patients in a healthcare setting, include strengths and weaknesses

3. Results And Discussions

Q.How is Gemini AI different from other AI bots?

By analyzing the improvements and unique advantages provided by Gemini AI compared to other AI technologies, it allows for better scope on its impact in the healthcare industry[9]. These advantages include:

3.1. Multimodal Capacities: With its cutting-edge multimodal skills, Gemini AI sets itself apart as a Google next-generation AI model, outperforming both its predecessors and peers[10]. Gemini combines and analyzes text, photos, audio, video, and code simultaneously, in contrast to standard AI models that concentrate on single data types. This allows Gemini to provide unmatched sophistication in reasoning and problem-solving across a variety of data formats[11]. Thanks to this development, Gemini can now provide more insightful and nuanced responses that are contextually relevant, raising the bar for AI technology. Gemini has the ability to completely transform consumer technology and services, as demonstrated by its incorporation with Google products like Bard and the Pixel 8 Pro, which highlights its exceptional user interface and accessibility characteristics[10]. Gemini's cutting-edge performance, demonstrated by its ability to outperform human experts in benchmarks such as huge multitask language processing, further validates its advanced capabilities and puts it in a leading position within the AI community[12].

3.2. Cutting Edge Performance: Gemini performs better than any other AI bot in a variety of workloads and benchmarks. In massive multitask language understanding (MMLU), a benchmark that assesses knowledge of the outside world and problem-solving skills in 57 subjects, it has outperformed human specialists[13]. This level of performance demonstrates its sophisticated reasoning abilities, which allow it to deliberate more thoroughly before responding to challenging queries.

Gemini AI demonstrates exceptional abilities in comprehending intricate human language, context and intent by utilizing Google's cutting-edge developments in natural language processing (NLP) and understanding (NLU). This makes it different from other AI bots that could have trouble with linguistic complexity and context by resulting in more accurate, pertinent and conversational interactions with users[14].

3.3. AI Ethics Framework: Google's Gemini AI stands out for its dedication to an ethical AI framework that not only complies with standard AI ethics norms but also extends beyond Google's overarching ethical technology development goals. In contrast to many other AI systems, Gemini AI's framework is thoroughly interwoven into each phase of its creation and functioning, emphasizing transparency, accountability and justice in a method that is both exacting and useful[15]. Using Google's vast experience managing sensitive data, this framework guarantees privacy and data security at a level that surpasses the usual norms used in the AI business. Furthermore, unlike many of its rivals, Gemini AI makes a commitment to making its decision-making processes accessible to both experts and users, placing a stronger emphasis on explainability and user confidence[15]. Gemini AI stands out for its dedication to ethical principles in practice as well as policy. This shows that the company is proactive in tackling the difficult ethical issues that arise with the deployment of AI technology, particularly in delicate areas like healthcare.

3.4. Collaborative Learning with Healthcare Professionals: Gemini AI's method of collaborative learning with healthcare professionals greatly increases its usefulness and efficacy in the medical industry. Gemini AI makes sure that its algorithms and replies are not only technically correct but also clinically relevant and in line with modern medical practices by actively involving medical specialists in its development and improvement. Through this partnership, there is a rich exchange of knowledge that enables healthcare professionals to use advanced AI capabilities to improve patient care and AI technology to be guided by real-world medical insights. This synergy has two benefits: by combining AI-driven insights and efficiencies, it enhances Gemini AI's capacity to handle complex healthcare situations with nuanced knowledge and precision and promotes innovation in medical practices[15]. In the end, this collaborative approach results in more precise diagnosis, customized treatment regimens and an all-around more efficient healthcare delivery system that is responsive to the evolving needs of patients and providers alike.

While Gemini AI has unique characteristics that allow it to perform better in situations that play in its strengths, it is still important to understand that other AI bots have their own strengths as well. As a result, other AI bots such as ChatGPT which have advanced metrics in fields necessitating precision, should be used when their characteristics provide an advantage, especially in the medical field when so many factors are at play[17].

Q. What is the research methodology to evaluate our model?

Having the right research methodologies to evaluate an AI model is crucial because it ensures the accuracy, reliability, and ethical integrity of the AI, facilitating its safe and effective application across diverse real-world scenarios.[9] Therefore, we used common, well-respected, core scenarios to evaluate our model to prove its effectiveness.

Gemini AI's linguistic capabilities were examined in-depth in peer-reviewed studies, including how well it performed on knowledge-based question-answering tests like the MMLU benchmark[13]. The study covered the evaluation processes, subtask results inside the MMLU framework, and querying details for Gemini. It offered information about the accuracy of the model as a whole, how well it performed on individual subtasks and an analysis based on the length of the output in chain-of-thought prompting. The research specifically discussed how the Gemini Pro fared in contrast to other models, such as the GPT 3.5 Turbo and GPT 4 Turbo, highlighting the areas in which Gemini outperformed or fell short of expectations[17]. Gemini's strengths in multimodal understanding and its adaptability to various evaluation techniques, such as standard prompts and chain-of-thought prompting, are highlighted by this thorough evaluation.

Q. How do the dimensions compare across foundational models?

Large language models (LLMs) and different deep learning architectures are examples of basic models in the field of artificial intelligence that differ greatly in terms of their dimensions-that is, in terms of their size, complexity, and capacity[18]. Dimensions are often used to describe characteristics or parts of the data that are utilized to train and function the chatbot, including contextual awareness, language understanding, and number of parameters (basic calculations within models). In contrast to current LLMs like GPT and BERT (Bidirectional Encoder Representations from Transformers), which include up to billions of parameters, early neural networks contained thousands to millions of parameters[19]. Deeper layers and larger models typically capture a wider range of subtleties in the data, resulting in a more complex understanding and predictive capabilities. But scaling up comes with higher energy and computing costs, which raises questions about effectiveness and environmental impact[20]. Furthermore, performance can be greatly impacted by the architecture of the model and the caliber of the training data, irrespective of the model's size.

3.5. Architecture and Scale: This covers the model's scalability, architectural approach (such as transformer-based, convolutional, etc.), and parameter size[21]. As a relatively new technology, Gemini AI demonstrates improvements in efficiency and scalability, tailored to handle multimodal data (text, images, audio and video) with ease.

3.6. Performance on Benchmarks: Models are assessed by how well they perform on a variety of benchmarks for tasks like multimodal tasks, translation, picture recognition and natural language understanding[9]. Gemini AI differs from models that might do well in single-modality tasks in that it is designed for state-of-the-art performance across several benchmarks, particularly in multimodal comprehension[13].

3.7. Generalization and Adaptability: It's critical that the model be able to adjust to new, unforeseen data or tasks and generalize across tasks[22]. The multimodal basis of Gemini AI implies a high level of flexibility and generalization, which may even outperform more specialized models.

3.8. Efficiency and Accessibility: This refers to the model's latency in real-time applications, accessibility for developers, and computational efficiency[23]. With variations including Ultra,

Pro, and Nano that meet a range of purposes from on-device apps to data center deployment, Gemini AI is made to be as adaptable as possible. This may provide it an advantage over other models in terms of efficiency and accessibility[13].

3.9. Ethical Considerations and Bias Mitigation: The ethical development of AI, bias mitigation, and fairness are becoming more and more important factors to consider while evaluating foundational models[24]. The creation of Gemini AI within the parameters of Google's AI Principles framework implies a dedication to ethical AI development; nonetheless, the success of these measures is a crucial point of comparison.

Researchers are examining approaches to balance the trade-offs between size, accuracy and resource requirements in order to achieve greater performance with more compact and economical models as AI continues to progress. The dynamic nature of AI research is reflected in this continual evolution, which aims to develop models that are not just powerful but also useful for a variety of applications.

Q. What are the roles Gemini AI can take in the healthcare industry as a virtual doctor?

Artificial intelligence is able to process medical texts, comprehend patient questions and adhere to clinical guidelines thanks to LLMs and NLP. This allows AI-powered virtual doctors to diagnose and prescribe medication[25]. By improving accessibility and efficiency, this connection with virtual healthcare has the potential to revolutionize the field by acting as a first line of support for licensed healthcare practitioners.

3.10. Triage of Patients and Symptom Evaluation: By swiftly evaluating enormous volumes of data, including medical histories and present symptoms, AI may greatly improve patient triage and symptom evaluation. This allows care to be prioritized based on urgency and possible diagnosis. Additionally, this technology can provide quicker and more accurate assessments, which can speed up the process of identifying individuals who are at-risk and enhance overall results.[26] AI may also help medical personnel by suggesting diagnostic tests, which can cut down on wait times and guarantee that patients receive essential care promptly[26].

Medical Information Retrieval and Decision Support: Provide healthcare practitioners with up-to-date information to support clinical decision-making by swiftly sorting through voluminous medical literature and databases[27].

3.11. Personalized Patient Interaction: By evaluating each patient's unique health history and preferences, AI can personalize patient interactions by delivering health recommendations and conversations that are more pertinent and interesting for each patient[28]. AI allows healthcare providers to personalize prescription programs for better results by using machine learning algorithms to predict patients' drug adherence and possible side effects[29]. AI-powered solutions can also improve the entire pharmaceutical administration process by sending timely reminders and follow-ups concerning medication regimens, dose modifications and health check-ups.

3.12. Mental Health Support: AI chatbots can offer people instantaneous, round-the-clock emotional support and therapy. This can be a first step in helping those who are reluctant to ask for help because of stigma or accessibility concerns. These chatbots enhance traditional mental health services with scalable and customized support by monitoring mental health state, guiding users through therapeutic procedures, and elevating treatment when needed[30]. They do this by utilizing machine learning and natural language processing.

3.13. Navigating the Healthcare System: By intelligently navigating people through the intricacies of healthcare systems, such as identifying the appropriate specialists, comprehending their insurance benefits, and making appointments, artificial intelligence (AI) can expedite the process of healthcare navigation for patients. By providing virtual help and translation services, it can improve accessibility by removing language barriers and improving the understandability and usefulness of healthcare information for a variety of demographics[31]. AI-driven language translation can greatly improve communication in the medical field by assisting medical practitioners and patients who speak different languages[32]. This will improve patient understanding and care quality even in the face of linguistic barriers.

3.14. Clinical Documentation Automation: By automatically creating and arranging clinical documentation based on spoken or written notes, this technology helps healthcare providers handle less administrative work[33].

3.15. Remote Patient Monitoring: Through wearable technology and health apps, AI can remotely monitor patients. It can analyze data on behaviors and vital signs in real-time to spot abnormalities or crises and guarantee prompt response even when patients are not in the hospital[34]. AI-powered systems can also help patients efficiently manage their ailments from home by sending out individualized health suggestions and reminders for appointments or medicines[34].

3.16. Training and Education for Healthcare Professionals: By offering individualized learning experiences that adjust in real time to each professional's skill level and learning style, artificial intelligence (AI) has the potential to completely transform medical education and ensure more effective and focused information acquisition. Additionally, it can use virtual and augmented reality to replicate intricate medical scenarios, providing hands-on experience in a secure setting and improving procedural and clinical decision-making skills[35].

The potential for natural language generation and advanced comprehension to improve the quality and accessibility of medical services makes it imperative to recognize the roles of NLPs and LLMs in the healthcare industry[25]. Their incorporation into healthcare systems can result in more effective patient care, individualized treatment programs and a major decrease in the administrative load on medical staff, all of which will eventually improve patient satisfaction and outcomes.

Q. What are some medical devices (IOT devices (Internet of Things devices)) that can be improved through the use of Gemini AI?

The term "Internet of Medical Things" (IoMT) describes a networked infrastructure made up of software, hardware, and health services and systems[36]. By gathering, analyzing and transmitting health data, this network of technologically advanced tools is revolutionizing the way healthcare is delivered[37]. IoMT devices, which are all connected to improve patient monitoring, increase disease management, decrease inefficiencies, and personalize patient care, range from wearable fitness trackers to sophisticated diagnostic instruments. IoMT plays a key

role in the development of smart healthcare ecosystems by utilizing the power of internet connectivity to provide real-time health monitoring, remote patient care, and data-driven insights into patient health[38]. By enabling smarter data analysis and decision-making, enhancing device interoperability and facilitating predictive maintenance and personalized healthcare interventions, artificial intelligence can significantly improve the Internet of Medical Things (IoMT). This will revolutionize patient care and operational efficiency within healthcare ecosystems. The following are some particular instances of IoMT devices that could be impacted by the application of AI, such as Gemini AI:

3.17. Wearable Health Monitors: Gemini AI may be able to give more precise and individualized health insights to gadgets such as fitness trackers and smartwatches. Through the analysis of data from multiple sources (text, photos, audio), Gemini could provide thorough health advice, identify abnormalities sooner and even anticipate possible health problems before they worsen[39].

3.18. Smart Inhalers: Has the ability to detect potential environmental triggers for patients with asthma and COPD by analyzing environmental data in conjunction with patient health data. Patients could benefit from being alerted to take preventative action or from being able to avoid high-risk places[40].

3.19. Connected Insulin Pumps: Gemini AI has the potential to improve connected insulin pumps by automatically adjusting insulin levels by evaluating a larger range of data points, such as nutrition, exercise, and sleep patterns[41]. Personalized treatment programs and improved blood sugar control may result from this all-encompassing strategy.

3.20. Smart Prosthetics: Gemini AI could be used by prosthetics with embedded sensors to better respond in real-time to the user's movements and surroundings, providing a more comfortable and natural experience[42]. The prosthetic's responsiveness and functionality can be greatly improved by Gemini's capacity to handle multimodal data.

3.21. Digital Pathology Systems: By enhancing the examination of pathology slides, Gemini AI can revolutionize digital pathology. It might combine visual slide data with text-based clinical data to help discover patterns that the human eye would overlook, make therapy recommendations based on a thorough examination of the patient's health, and provide more accurate diagnoses[43].

3.22. Medical Imaging Devices: Gemini AI's sophisticated image processing powers could be useful for devices like CT and MRI scanners[44]. Through the integration of clinical text data and patient history with imaging data, Gemini has the potential to facilitate faster abnormality identification, illness progression prediction and therapy recommendation for radiologists.

3.23. Telehealth Platforms: By boosting the virtual consultation experience, Gemini AI may be able to improve telehealth services[45]. In order to give clinicians insight into a patient's mental and physical state, it would examine both verbal and nonverbal clues from the patient. This could help discover underlying health issues that the patient may not be aware of.

3.24. Smart Mattresses and Beds: Smart beds with sensors can track vital signs, sleep patterns, and patient mobility for both in-hospital and at-home care[46]. AI can evaluate this information along with health and environmental data to maximize patient comfort, avoid pressure ulcers and notify caregivers of possible health problems before they become more serious.

3.25. Implanted Cardioverter-Defibrillators (ICDs): Gemini AI could improve ICDs by evaluating a wider variety of data to more precisely anticipate and avert major cardiac events[47]. It might provide tailored changes to the device settings, enhancing patient outcomes, by fusing real-time monitoring with patient health data.

3.26. Personal Emergency Response Systems (PERS): By adding more advanced algorithms for fall detection and abnormal behavior monitoring, Gemini AI could enhance PERS devices, which are frequently used by the elderly or people with critical medical conditions[48]. As a result, emergency responses could be made more quickly and precisely by taking into account the user's typical behavior as well as the situation at hand.

3.27. Smart Medication Dispensers: These gadgets have the potential to use Gemini AI to improve and manage people's medication schedules, particularly for those with complicated regimens[49]. In order to prevent non-compliance and ensure that caregivers take their medications on time, Gemini AI could evaluate past compliance data in addition to health data from other devices.

Q. How will Gemini AI impact patient quality of life?

Artificial intelligence has a direct impact on the quality, accessibility, and personalization of healthcare services that patients get, thus it's critical to understand how this technology affects patients[50]. By being aware of these effects, artificial intelligence technology can be optimized to better serve patients, improve health outcomes, and guarantee that the introduction of AI into healthcare systems is carried out in a way that upholds privacy and individual dignity while also being safe and ethical.

We used a two faceted approach to analyze both the strengths and weaknesses of Gemini AI's impact on patientcare.

Increased Accessibility to Healthcare: The integration of Gemini AI into the healthcare industry greatly expands the availability of medical services. In distant or underserved areas where medical personnel are few, people can receive timely healthcare counsel by having 24/7 access to medical information and support[51]. This technical development fills the gap between patients and healthcare resources, guaranteeing that time constraints and geographic location will never again prevent access to critical medical advice. In addition, Gemini AI's capacity to provide prompt answers to health-related queries implies that people can easily access vital health information, encouraging the early identification and treatment of health problems[52]. As a result, a larger segment of the population can now afford timely and equal access to medical services in a more inclusive healthcare environment.

3.28. Personalized Patient Care: The aforementioned potential of Gemini AI to provide individualized patient care transforms the way chronic illnesses are managed, paving the way for much more specialized and efficient medical treatments. Through the examination of personal medical histories, lifestyle choices, and ongoing wearable data streams, Gemini AI is able to create personalized treatment regimens that are tailored to the specific requirements of every patient[3]. Treatments are better matched to the patient's unique health conditions, preferences and reaction

patterns thanks to this individualized approach, which may boost adherence and enhance results. Furthermore, Gemini AI's real-time feedback mechanisms and constant monitoring offer a proactive support system for people managing chronic diseases[53]. With the use of this technology, patients can better manage their health by receiving actionable information that can be used to change therapies based on their current health status. Thanks to these developments, Gemini AI significantly improves the quality of life for individuals suffering from long-term illnesses, increasing responsiveness, efficiency, and patient-centered treatment.

3.29. Instant Medical Information: Gemini AI's introduction to the healthcare industry has transformed patient interactions with health services by providing the unmatched advantage of instantaneous access to medical information. This instantaneity is especially revolutionary when it comes to circumstances when prompt information can allay fears, direct judgment, or even avert difficulties[16]. The delays and uncertainty that frequently accompany traditional medical consultations are no longer a burden for patients to deal with. Alternatively, individuals may always rely on precise, AI-driven answers to their health-related questions, which directly supports informed health care and mental clarity. This capability greatly lowers the informational barriers that can impede the provision of good healthcare, while simultaneously enhancing patient autonomy by providing individuals with knowledge. Gemini AI is essentially a bridge that connects individuals to the medical insights they require at the appropriate time, democratizing real-time access to health information.

3.30. Risk of Misinterpretation: When AI technologies are used to ease conversations, misinterpretation is a serious issue, particularly in delicate fields like healthcare. While broadening the potential of AI interactions, powerful algorithms and reasoning powers cannot ensure the nuanced comprehension needed in patient discussions[54]. Due to the technical nature of medical terminology, the individualized context of health information, and the emotional states that might impair comprehension, patients are especially susceptible to misinterpreting AI-generated recommendations[6]. For example, even with its sophisticated capabilities, an AI system like as Gemini may present information that patients would misunderstand in the absence of a human healthcare provider's contextual judgment and compassionate touch. This concern emphasizes how crucial it is to combine artificial intelligence (AI) technologies with human monitoring in healthcare settings to make sure that medical advice is understandable, clear, and customized in order to avoid misunderstandings and their potentially harmful implications on patient health and treatment outcomes.

3.31. Privacy and Data Security Concerns: In the digital era, privacy and data security are critical issues, particularly as AI systems such as Gemini AI grow more ingrained in our daily routines. Large-scale personal data gathering, processing, and storage by AI systems presents serious privacy risks due to the possibility of abuse, illegal access, or data breaches[55]. Moreover, worries about surveillance and the loss of anonymity are heightened by AI's strong capacity to comprehend and predict individual behaviors and preferences. Another crucial concern is protecting data from cyberattacks and illegal disclosures[55]. To secure personal data and preserve confidence in AI technologies, strict data protection regulations, open data management procedures, and strong cybersecurity measures are required. Addressing these issues and promoting a safe and privacy-aware digital environment depend heavily on developing AI responsibly, with an emphasis on ethical issues and privacy protection.

3.32. Lack of Human Empathy and Understanding: One major problem with AI-driven interactions is that they lack human empathy and understanding, especially in areas like personal help, customer service, and healthcare. While more "human-like" interactions are made possible by improvements in AI technology, AI systems are not capable of full empathy or a comprehensive, contextual knowledge of human emotions and sensitivities[56]. This constraint may result in exchanges that, although factually correct, could come across as impersonal, misinterpreted, or emotionally under-reached. Such deficiencies in emotional intelligence can have an impact on user happiness, emotional health, and AI efficacy in general when dealing with situations where a sophisticated comprehension of human emotions and experiences is necessary[57]. More meaningful and encouraging connections will depend on discovering ways to close this gap as AI develops, maybe through hybrid models that blend human empathy with AI efficiency.

4. Conclusion

In conclusion, our examination of Google's Gemini AI underscores its transformative potential within the healthcare industry, especially as a virtual doctor. By leveraging its advanced multimodal AI capabilities to understand and process a wide array of information types, Gemini AI stands out in its ability to enhance patient care and integrate with the Internet of Medical Things (IoMT). Through a detailed comparative analysis, our study highlights Gemini AI's strengths in improving healthcare delivery and personalized patient support, while also acknowledging the challenges that need addressing for its fuller integration into medical services. The insights gathered from this research, validated by an extensive literature review, confirm the significant role Gemini AI could play in reshaping healthcare, promising a future where AI-driven solutions offer more efficient, accessible and personalized care.

5. References

1. Gillioz A, Casas J, Mugellini E, Khaled OA. Overview of the Transformer-based Models for NLP Tasks. Proceedings of the 2020 Federated Conference on Computer Science and Information Systems, 2020.
2. Yenduri G, Ramalingam M, Chemmalar SG, et al. Generative Pre-trained Transformer: A Comprehensive Review on Enabling Technologies, Potential Applications, Emerging Challenges and Future Directions, 2023.
3. https://blog.google/technology/ai/google-gemini-ai/#sundar-note
4. https://medriva.com/health/healthcare/the-impact-of-googles-gemini-ai-on-the-healthcare-industry/
5. https://blog.google/technology/health/google-generative-ai-healthcare/
6. Khan B, Fatima H, Qureshi A, et al. Drawbacks of Artificial Intelligence and Their Potential Solutions in the Healthcare Sector. Biomedical Materials & Devices, 2023;1:1-8.
7. Iftikhar L, Iftikhar M, Hanif M. DocGPT: Impact of ChatGPT-3 on Health Services as a Virtual Doctor. Cronicon, 2023.

8. Altamimi I, Altamimi A, Alhumimidi AS, Altamimi A, Mohamad-Hani Temsah. Artificial intelligence (AI) chatbots in medicine: A supplement, not a substitute. Cureus, 2023;15.
9. Bandi A, Adapa PVSR, Kuchi YEVPK. The Power of Generative AI: A Review of Requirements, Models, Input–Output Formats, Evaluation Metrics and Challenges. Future Internet, 2023;15(8):260.
10. 10.https://medium.com/@hegde.sateesh/googles-gemini-ultra-redefining-ai-with-multimodal-capabilities -and-challenging-openai-s-b7b786f1afd7
11. Cascella M, Semeraro F, Montomoli J, Bellini V, Piazza O, Bignami E. The Breakthrough of Large Language Models Release for Medical Applications: 1-Year Timeline and Perspectives. J of Medical Systems. 2024;48(1):22.
12. Nyaaba M. Comparing Human and AI's (GPT-4 and Gemini) Understanding of the Nature of Science. Social Science Research Network. Published online January 1, 2023.
13. Gemini Team, Anil R, Borgeaud S, et al. Gemini: A Family of Highly Capable Multimodal Models, 2024.
14. Tyagi N, Bhushan B. Demystifying the Role of Natural Language Processing (NLP) in Smart City Applications: Background, Motivation, Recent Advances, and Future Research Directions. Wireless Personal Communications, 2023.
15. https://deepmind.google/technologies/gemini/#gemini-1.5
16. https://blog.google/technology/health/google-generative-ai-healthcare/
17. Qi Z, Fang Y, Zhang M, et al. Gemini vs GPT-4V: A Preliminary Comparison and Combination of Vision-Language Models Through Qualitative Cases, 2023.
18. Alberts IL, Mercolli L, Pyka T, et al. Large language models (LLM) and ChatGPT: what will the impact on nuclear medicine be? European Journal of Nuclear Medicine and Molecular Imaging, 2023.
19. Luigi De Angelis, Baglivo F, Guglielmo Arzilli, et al. ChatGPT and the rise of large language models: the new AI-driven infodemic threat in public health. Frontiers in Public Health, 2023;11.
20. Dhar P. The carbon impact of artificial intelligence. Nature Machine Intelligence, 2020;2(8):423-425.
21. As I, Basu P. The Routledge Companion to Artificial Intelligence in Architecture. Routledge; 2021.
22. Sarker IH. AI-Based Modeling: Techniques, Applications and Research Issues Towards Automation, Intelligent and Smart Systems. SN Computer Science, 2022;3(2).
23. Cui M, Zhang DY. Artificial intelligence and computational pathology. Laboratory Investigation. 2021;101(4):412-422.
24. Erkal EY, Akpinar A, Erkal HS. Ethical Evaluation of Artificial Intelligence Applications in Radiotherapy Using The Four Topics Approach. Artificial Intelligence in Medicine, 2021;115:102055.
25. Davenport T, Kalakota R. The Potential for Artificial Intelligence in Healthcare. Future Healthcare Journal, 2019;6(2):94-98.
26. Baker A, Perov Y, Middleton K, et al. A Comparison of Artificial Intelligence and Human Doctors for the Purpose of Triage and Diagnosis. Frontiers in Artificial Intelligence, 2020;3.
27. Koleck TA, Dreisbach C, Bourne PE, Bakken S. Natural language processing of symptoms documented in free-text narratives of electronic health records: a systematic review. Journal of the American Medical Informatics Association: JAMIA. 2019;26(4):364-379.
28. Johnson AJ, Palit S, Terry EL, et al. Managing osteoarthritis pain with smart technology: a narrative review. Rheumatology Advances in Practice. 2021;5(1).
29. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4525262/
30. https://mashable.com/article/how-to-chat-with-chatgpt-mental-health-therapy
31. Knight DRT, Aakre CA, Anstine CV, et al. Artificial intelligence for patient scheduling in the real-world health care setting: A metanarrative review. Health Policy and Technology. 2023;12(4):100824.
32. Yan R, Liao W, Cui J, Zhang H, Hu Y, Zhao D. Multilingual COVID-QA: Learning towards Global Information Sharing via Web Question Answering in Multiple Languages. Proceedings of the Web Conference 2021.
33. https://www.predera.com/blog/automatic-extraction-of-clinical-notes-using-nlp-2
34. Buddha, Siva Kumar. "Use of in Healthcare." 2023.
35. Chary M, Parikh S, Manini A, Boyer E, Radeous M. A Review of Natural Language Processing in Medical Education. Western Journal of Emergency Medicine, 2018;20(1):78-86.
36. Javaid M, Khan IH. Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic. Journal of Oral Biology and Craniofacial Research, 2021;11(2):209-214.
37. Haleem A, Javaid M, Khan IH. Internet of things (IoT) applications in orthopaedics. Journal of Clinical Orthopaedics and Trauma, 2020;11:S105-S106.
38. Hanif M, Iftikhar L, Iftikhar M. Internet of Things (IoT) Towards Specialty-Specific Internet of Orthopaedic Things (IOT): The Evolution and Applications of Internet of Medical Things (IoMT). Cronicon, 2023.
39. Merle G, Parent-Harvey A, Harvey EJ. Sensors and digital medicine in orthopaedic surgery. OTA International: The Open Access J of Orthopaedic Trauma, 2022;5(2S):e189.
40. Greene G, Costello RW. Personalizing medicine - could the smart inhaler revolutionize treatment for COPD and asthma patients? Expert Opinion on Drug Delivery, 2019;16(7):675-677.
41. Pillalamarri SS, Huyett LM, Abdel-Malek A. Novel Bluetooth-Enabled Tubeless Insulin Pump: A User Experience Design Approach for a Connected Digital Diabetes Management Platform. J of Diabetes Science and Technology, 2018;12(6):1132-1142.
42. Wu Y, Liu Y, Zhou Y, et al. A skin-inspired tactile sensor for smart prosthetics. Science Robotics, 2018;3(22).
43. Hanna MG, Ardon O, Reuter VE, et al. Integrating digital pathology into clinical practice. Modern Pathology, 2022;35(2):152-164.
44. Park SR, Park JY, Ghani R, Ha J, Hester T. Visualising the Future of Orthopaedic Surgery: A Novel Application of Wireless Smart Glasses to Visualise Intraoperative Imaging. Cureus, 2022.
45. Mahtta D, Daher M, Lee MT, Sayani S, Shishehbor M, Virani SS. Promise and Perils of Telehealth in the Current Era. Current Cardiology Reports, 2021;23(9).
46. Davoodnia V, Etemad A. Identity and Posture Recognition in Smart Beds with Deep Multitask Learning. IEEE Xplore.
47. DiMarco JP. Implantable cardioverter-defibrillators. The New England Journal of Medicine, 2003;349(19):1836-1847.
48. Stokke R. The Personal Emergency Response System as a Technology Innovation in Primary Health Care Services: An Integrative Review. Journal of Medical Internet Research, 2016;18(7):e187.
49. Tsai PH, Chen TY, Yu CR, Shih CS, Liu JWS. Smart Medication Dispenser: Design, Architecture and Implementation. IEEE Systems Journal, 2011;5(1):99-110.
50. Ahuja AS. The impact of artificial intelligence in medicine on the future role of the physician. PeerJ, 2019;7(7702):e7702.

51. Saqib M, Iftikhar M, Neha F, Karishma F, Mumtaz H. Artificial intelligence in critical illness and its impact on patient care: a comprehensive review. Frontiers in Medicine, 2023;10.

52. Chubb J, Cowling P, Reed D. Speeding up to keep up: exploring the use of AI in the research process. AI & SOCIETY, 2021;(37).

53. Schork NJ. Artificial Intelligence and Personalized Medicine. Precision Medicine in Cancer Therapy. 2019;178:265-283.

54. Emre Sezgin. Artificial intelligence in healthcare: Complementing, not replacing, doctors and healthcare providers. DIGITAL HEALTH, 2023;9.

55. Murdoch B. Privacy and artificial intelligence: challenges for protecting health information in a new era. BMC Medical Ethics, 2021;22(1).

56. Montemayor C, Halpern J, Fairweather A. In principle obstacles for empathic AI: why we can't replace human empathy in healthcare. AI & SOCIETY, 2021;37.

57. Esmaeilzadeh P, Mirzaei T, Dharanikota S. Patients' Perceptions Toward Human-Artificial Intelligence Interaction in Health Care: Experimental Study. Journal of Medical Internet Research, 2021;23(11):e25856.