

Understanding the Potential of Using Artificial Intelligence in Healthcare Sector: A Case Study of Google's Innovations & Research

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Abstract

Artificial Intelligence through its ability to learn from LLM has affected our lives in the most unusual ways. It has made complex calculations easy by training on large data sets. It is able to predict better, detect earlier. It has helped in automation, thereby reducing dependence on human beings in some cases. Healthcare is a sector which can benefit massively from the advancement of technology powered by Artificial Intelligence if proper large number of datasets are fed into the systems. Work is being continuously done to equip ourselves in a better way using the power of AI. There are multiple ways in which AI powered technology can assist the healthcare professionals. Among the many companies constantly engaging in research and development to help solve problems of the society is Google. According to a report by Statista there are 250million people using AI driven tools across the world. Google alone experiences 8.5 billion search queries on its search engine every day. The power of technology innovated by Google has the power to reach those who need it most and a wider market. The paper explores the different Case study of Google's innovation and research work in healthcare. It also tries to comprehend the scope and challenges of using AI in the healthcare sector.

Keywords: Google Healthcare, Artificial Intelligence, AI in Healthcare, Algorithms

Introduction:

The field and discipline of medicine and healthcare is clearly a multimodal one. Multiple data and information are stored for patients that may range from lab diagnostic results to X-ray reports to genetic data and other symptoms allergies etc. (Matias, 2024). It is important to be able to access this data to understand a Patient's health condition in an accurate way. Generative AI can help in streamlining the data collection, storage and management. It can help in fastening the process of 'clinical trials' by helping improve the trial design. Artificial Intelligence can help in personalizing patient engagement by personalizing the tools. Basic queries can also be noted using chatbots in the healthcare facility. If ample amount of Data is made available, then it will be possible to have proper predictive analysis and this in turn will help in decision making of the doctors with critical cases. Stratification of risk can also be done better with the help of AI. The use of Clinical Decision Support and Electronic Health Records can help curating an informed personalized treatment (Editorial Staff, 2024). Extraction of health data can be beneficial in flagging key components and issues of a person. Not just physical health will benefit from NLP, but mental health will be an area that will largely benefit. Say for example, use of suicide prediction models to facilitate prevention and intervention (Papini et al., 2024). Capacity management and use of

Generative AI in managing data can help in management of hospitals better. The use of Imaging Analytics with the help of Artificial Intelligence can help get support for screening precision, assessment of risk and for rendering medicine in a precision way. We have seen during Covid 19 that patients might not be always able to go to a doctor, in this case virtual care and telecare can implement ‘remote patient monitoring’. AI can benefit the RPM systems to continuously send and receive data marking any deviation or anomalies in data. They can learn from a patient’s case history and baseline biometrics. Robotics have already made its foray into surgery, with generative AI, the efficiency can become much better.

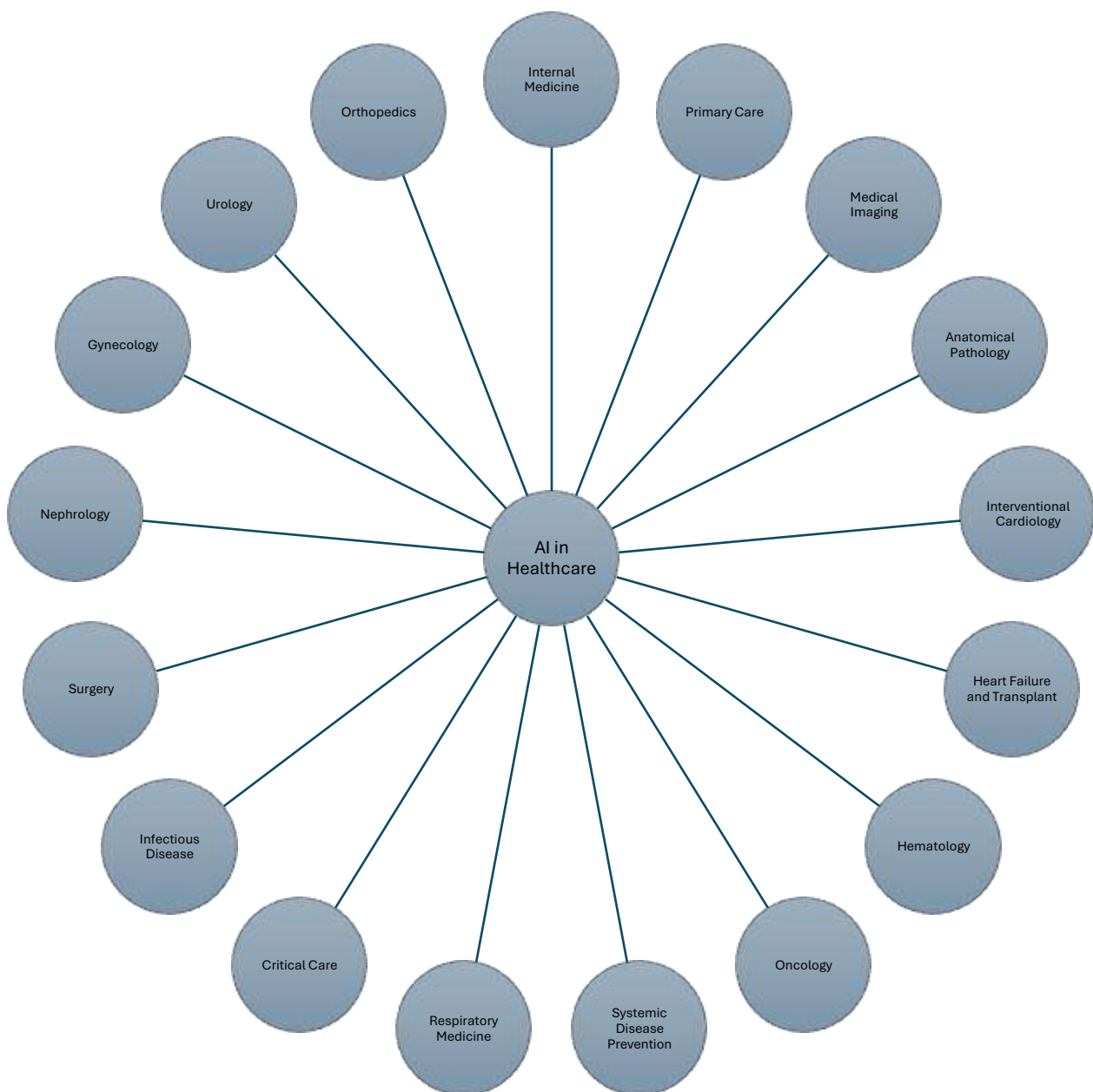


Figure represents different sectors of healthcare and medicine that are address by AI (Krittanawong, 2023). The figure has been compiled from the research work published in ‘Artificial Intelligence in Clinical Practice’ Edited by Chayakrit Krittanawong.

Android Inc was bought in 2005 by Google and today android occupies about 70% of the mobile market share worldwide. Google’s perspectives on why it is interested in AI or is working on it shares an interesting insight. It shares that Google is motivated to ‘organize’ and make accessible the world’s information for all. Google believes that AI is a transformational and foundational technology and has key benefits for the society. They are aiming to help people with breakthrough innovations that will help in tackling challenges of the world (Manyika et al.). The development of AI for any sector can be a game changer only when the technology is accessible by all without biases and prejudices. Google’s focus on Responsible AI is crucial for the induction of AI in society. Google’s recent developments in Healthcare with AI in fields like ARDA (Automated Retinal Disease Assessment) has helped in early detection of diabetic retinopathy and has even helped in finding out the chances of other diseases. Google’s work with ultrasound AI in Kenya in partnership with Jacaranda Health is trying to give more access to ultrasound tech to people where there is absence of trained sonographers. As an organization, Google’s dedication to making healthcare accessible to people through the use of AI in future, is the reason why I have chosen the company as a case study. The research paper does a case study analysis of the technology and innovation work being done by google in the field of Healthcare powered by AI.

Objective of the Study:

1. To understand the upcoming technology in the field of AI in Healthcare from Google through a case study analysis.
2. To understand the challenges to the implementation of AI in Healthcare.

Review of Literature

The first most important aspect of using AI in healthcare must deal with the amount of data and monitoring them. AI can assist clinical trials in better monitoring of large volume of data with precision results. Medical companies specializing in AI can develop applications that help assist a patient at different levels of their treatment (Shaheen, 2021). The ever-increasing expenses of healthcare, shortage of staff and professionals all push us to adopt AI in healthcare. Since the demographic of the countries are changing, the costs of living a healthy life will be expensive over the period. AI will be able to lower costs of healthcare and ease the workload and pressure of working professionals. Preventive healthcare, virtual assistance from nurses, monitoring service for critical and non-critical patients would all greatly benefit from AI in healthcare (Väänänen et al., 2021). The technological workflow used by applications of healthcare using AI are:

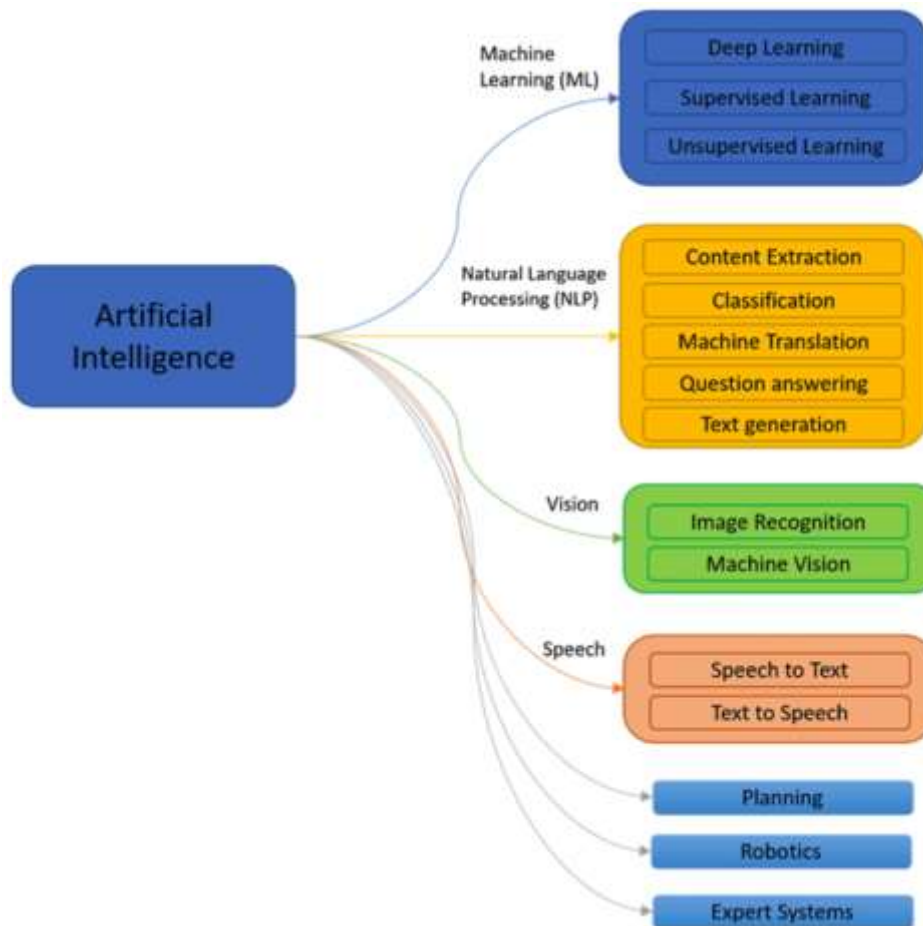


Figure represents methods applied by AI based applications in healthcare. Source:

<https://doi.org/10.12688/f1000research.26997.2>

Explainable Artificial Intelligence, better known as EXAI is used for AI powered diagnosis. EXAI will be able to interpret and explain the model through a framework that is self explanatory. EXAI can provide reasons to the end users on its decisions through data analysis and interpretation (Saraswat et al., 2022). But even as we analyse the possibility of churning large volume of data into interpretation, we cannot overlook the perspective of data management and its legalities in the process. How much data is to be shared whether the patient will have access to just the interpretation or the model’s explanation in complete form is a question that is still unanswered. Informed consent is a concept that has to be closely followed (Amann et al., 2020). While the technology of AI is still in a stage of development and its accuracy is being explored, the question of biases with AI Algorithms is also a possibility. There is a need to train the AI models in a safe usage environment where the privacy concerns would also be met. So not just a technical perspective there is also a need to explore the governance perspective of using AI in healthcare if we must ensure complete transparency in the use of this upcoming and emerging technology to its best use (Reddy et al., 2019).

Case Study Analysis of Products and Technology Developed by Google

1. Google’s Generative AI, MedLM and MedLM 2 curated for healthcare:

MedLM is actually a Large Language Model made by Google Research for the medical industry. It is designed to provide high quality precision answers. This LLM uses the power of Google’s advanced

language models on medical exams, customer related queries and medical research. It was the first pioneer application that crossed 60% pass marks in relation to queries in the nature of questions styled after the US Medical Licensing Exam. There was a need to further develop a system where the Artificial Intelligence output could include open ended questions and long form questions in alignment with human values and cultural values. To develop these qualities the MedLM 2 was developed. Better domain specific medical fine tuning was done. The challenge was to finetune the LLM in a way where there would be better consensus between a physician's answers and the application. A success of 72.9% was achieved in this case with MedLM2 (Singhal et al, 2023).



Fig. This scanned image was put for AI analysis and the following findings were suggested. There is no pneumothorax in the lungs and not much pleural effusion and it seems that lungs are clear. The image shows normal size of heart with mediastinal contours being present in usual limits, neither was any abnormality found in the skeleton. The final impression was the absence of any active disease in the person's chest.

2. Google's HeAR AI for lung disease :

'Health Acoustic Representation' or (HeAR) analyses sound patterns based on the functions of a bio-acoustic model. It can produce insights on the patient's lung health based on the sound patterns. An India based company specializing in respiratory health care genre has already planned to use this to increase the chances of TB detection. Sujay Kakarmath who is the product manager working at Google Research and is working with HeAR says that roughly a total number of 100 million different cough sounds have been used to model the application and can prove to be a transformative journey towards early detection of TB. He also highlights the current situation where TB often is diagnosed late due to absence of affordable form of healthcare (Tech Desk, Indian Express, 2024). Not just that, using 300 million sound clips, HeAR identifies patterns that identify the problem. Google is also working with institutions like Stop TB Partnership for removing TB by 2030 (Staff, First Post, 2024). The use of HeAR will make screening more affordable through cough sound analysis. However, it must be kept in mind that HeAR is not a model for diagnostic and neither is it a cough detector. It is a neural network using ViT-L Architecture (Google-Health, n.d.).

3. GoogleFitbit and Pixel Watches with AI Chatbot as Personal Coach

Fitbit is an activity and health tracker worn by the people on their wrist to record and keep track of their health parameters and lifestyle. It is compatible with multiple mobile platforms. In 2021 Google completed the acquisition of fitbit and marked its foray into smart wearables. From being Fitbit by Google to GoogleFitbit, it has been more than a branding exercise. Google has been working closely on the development of fitbit to equip it with better technology. Karen DeSalvo who is the Chief Health Officer at Google recently said, the company is building LLM with personal health as priority. It is being built on

Gemini platform. According to Karen DeSalvo, AI will never replace doctors but doctors who use AI will replace those who are not using the technology. The latest offering is an AI Fitness Coach that will be a constant monitor of the heartrate, changes in heartrate, sleep cycle, exercise, schedule and basic vitals of a consumer using it (Jennings, 2024). The product is aimed at providing personal insights to the consumers and does not intent to provide any treatment nor diagnose any medical condition for the consumer. Google is also working on AIME LLM (Articultae Medical Intelligence Explorer) to help professionals carry out their job of diognosis and communication with patients more efficiently (Kaustubh, 2024).

Harvard Medical School's Thoughts on AI in Healthcare

One of the biggest challenges is to connect with a doctor in between to discuss issues like clarification on medication or other doubt clearing. It is often difficult for nurses and doctors to immediately tend to such querries as themedical fraternity is over worked. In such a situation AI powered chatbots can take up the task. The bigger question is can chatbots reflect the same expertise or empathy as a doctor would. In a test conducted by Harvard Medical School based on a set of 195 questions it was found that the responses by chatbots were more empathetic. 78% responses by ChatGPT were perceived to be of good or very good quality by patients while doctor's feedback was 22%. The biggest difference was in the extent of empathy, the doctors noted a 4.6% positive response in context of empathetic replies while AI chatbots like ChatGPT scored 45% positive feedback. Moreover one of the limitations of such a study was evaluating the accuracy of the answers by ChatGPT which is of vital importance in medical field. It must also be kept in mind that the feedback on empathy might be related to the time frame of response and the length of the answers. The medical staff might not be able to give instant feedbacks and may be in a hurry and not engage in conversation of empathy. Hence it was observed by Harvard Medical School that AI must work in collaboration with the human professionals. Accuracy of answers must be of absolute importance in medical field (Shmerling, 2024).

Conclusion

Since these models using AI is based on data, the problem starts from data itself. For the AI models to be effective they must be based on high quality data and there has to be complete availability of this data in multiple sets for better interpretation and analysis. To give complete data sets might be the first challenge in healthcare. Also we must keep in mind that for the technology to completely use the data, for accurate interpretation there has to be a lot of sensitive personal data that would be made available to the aplication which would bring in challenges of privacy and security of data. If the data that is being used to train the models have bias in any way they would effect the analysis of the reports in future. Another big challenge might be to ubnderstand and interpret how the AI applications are coming to the conclusion that they are coming to. This can create confusion of decision making for health experts and problems of inaccuracy in assessment of the reports and images. We must also consider that treatment of patients or assessment of reports in the medical field is a personalised journey and generalisations might be difficult to implement. One set of data may interpret the result of one patient accurately while failing in another case due to variations in symptoms. Hence the data sets must be trained efficiently to observe these minor adjustments. Google's progress in the field of AI healthcare has been significant. Although the HeAR and MedLM 2 technologies are still in its stages of development, yet continuous updating and evaluation will make them gamechangers in the field of healthcare. ARDA and Google's AI powered Sonography projects have shown significant success in detection, better screening, ease of access for all. Google's AI Sonography

project will help even non experts give better prenatal care. Google's attempt to work on these technology on mobile devices and enabling them to work in areas without network can help them greatly in reaching out to remote places of the world where the support can be of maximum help. Even Google's initiatives of targetting the wearable technology industry with a mindset to improve personal healthcare will benefit the society in a big way. The integration of AI in fitbit and then later in other wearable devices will help people keep better track of their personal wellbeing and health. However, despite multiple evaluations and assessment of amazing scope of development and impact, it must be kept in mind, that the objective however is not to create a replacement of doctors and healthcare personnels but rather develop AI in healthcare as a complimentary force of the healthcare professionals.

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