GRIFFITH COLLEGE DUBLIN

Assignment Cover Sheet

Learner name(s): Ronal Sabu

Learner number(s): [redacted]

Assignment Type: **Individual:** yes **Group:**

Course: Medical Device Technology And Business **Stage/year:** Cohort 1

Module: Dissertation

Study Mode: Full time yes Part-time

Lecturer Name: Dr. Favour Okosun

Assignment Title: Evaluating The Integration Of Artificial Intelligence In Mri Systems: Impact On Diagnostic Precision And Workflow Optimization In India

No. of pages: 72

Uploaded to Moodle: Yes yes No

Additional Info:

Date due: 12/05/2025

Date submitted: 11/05/2025

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MSC Medical Device Technology And Business
Dissertation Resources

EVALUATING THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN MRI SYSTEMS: IMPACT ON DIAGNOSTIC PRECISION AND WORKFLOW OPTIMIZATION IN INDIA

-

Ronal Sabu

Supervisor: Dr. Favour Okosun

Dublin 2025

CANDIDATE DECLARATION

I, Ronal Sabu, certify that the dissertation titled “Evaluating The Integration Of Artificial Intelligence In Mri Systems: Impact On Diagnostic Precision And Workflow Optimization In India” submitted for my master’s degree in Medical Device Technology And Business, is entirely my own work. I confirm that all sources referenced in my research have been properly cited in the reference section. This work was done under the supervision of Dr. Favour Okosun

Signature: 

Date: 11/05/2025

Supervisor: Dr. Favour Okosun

Acknowledgement

I would like to begin by expressing my heartfelt gratitude to all those who have supported me throughout the course of this research.

First and foremost, I thank **God** for providing me with the strength, clarity, and perseverance necessary to complete this journey.

My heartfelt appreciation goes to my parents, **Sabu Cherian** and **Silvy Sabu**, whose unwavering love and resilience have shaped my values and inspired my dedication to learning. Their belief in me has been a constant source of motivation.

I am deeply thankful to **Griffith College** and **Innopharma Education** for providing an enriching academic environment and the knowledge necessary to undertake this research. Your commitment to education has had a lasting impact on my academic growth.

To my supervisor, **Dr. Favour Okosun**, I express profound gratitude for your thoughtful guidance, critical insights, and continuous encouragement. Your mentorship was invaluable in the completion of this dissertation.

I wish to express my sincere gratitude for the exceptional guidance and unwavering support provided by **Dr. Prosper Anaedu**, whose expertise and assistance were pivotal to the successful completion of this research.

I am also thankful to my friends and peers, especially **Shanto Santhosh and Sona k kurian**, for being a source of strength, laughter, and comfort along the way.

Finally, Special thanks to all the participants who contributed to this study. Your time, input, and openness added richness and depth to this research.

Ronal Sabu

Abstract

The purpose of this paper is to analyse the development of MRI systems with AI concepts within the overall context of healthcare systems in India. By employing secondary data collection complemented with the primary data collected through a structured survey conducted among a sample of radiologists, technicians, and healthcare administrators in India, the study investigates the effects of AI on diagnostic accuracy, authorized work, and productivity in MRI diagnostics. In contrast to the prior global studies, this paper explores the key issues in India such as infrastructure gaps, workforce repletion, and regulations and policies.

It is evident from the study that the implementation of AI can improve diagnostic competencies and also minimize procedure time in MRI, which is in sync with the trends across the world. Early stage anomaly: The respondents also indicated that the early stage anomaly was detected in time and the amount of work done by the radiologists was reduced. Thus, the implementation of AI in India is even more problematic due to a deficiency in the technical basis, AI-oriented staff education, and an underdeveloped structure of legislation for AI in medical imaging. This is due to a lack of clear regulatory directions from Indian regulatory bodies like the "Central Drugs Standard Control Organization (CDSCO)" or the inadequate clarity around data protection under the "Digital Personal Data Protection Act (DPDPA)".

The research indicates that, while the participants did not regard AI as a threat to radiologists jobs, it is viewed as a strong support tool if applied properly. It underlines that there is a strong requirement for India-specific AI regulation policies for AI solutions, proper institutional training programs for employees, and better IOT connections. Specific recommendations are directed to the heads and managers of Indian health care centers, AI developers, and policymakers as to cooperation in the AI-incorporated MRI diagnostics being safe, efficient, and suitable for patients needs. It adds contextual understanding to India's preparedness and issues, which forms the basis for more culturally appropriate advancements and use of AI in health imaging.

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Chapter 1: Introduction

1.1 Background

Over the last few years, medical imaging has experienced big breakthroughs, Magnetic Resonance Imaging (MRI) in particular has become an important tool in the diagnosis and care of different medical conditions. Earlier, MRI scans were still difficult to interpret and required a lot of effort and skill to read the MRI scan by radiologists. The introduction of Artificial Intelligence (AI) in MRI systems has been considered as a possible solution in making MRI diagnosis more precise, shortening workflow time for workflow efficiency, and maximizing the delivery of healthcare (Neyigapula, 2023). In addition to that, AI-powered MRI systems can assist in their automated image processing, and boost their ability to automatically find anomalies, cut down the scan time, or even direct radiologists in making well-informed decisions. In recent years, real-world implementation of AI-based tools such as GE Healthcare's AIR Recon DL and Siemens Healthineers AI-Rad Companion has shown improved image clarity, reduced scanning time, and enhanced diagnostic accuracy in clinical MRI applications across several countries (Paudyal *et al*. 2023).

India is marching toward the development of healthcare by taking up AI and digitizing. However, the use of AI in MRI diagnosis also comes with its own set of infrastructural constraints, ethical issues, legal hurdles, and whether or not medical professionals will approve (Bi *et al*. 2019). While various countries across the world have seen how AI may augment the diagnosis by MRI, and when it comes to adopting and integrating AI technologies in the Indian health sector, both the benefits as well the drawbacks must be weighed and assessed (Kumar *et al*. 2023). An implementation of AI assumes advantages and disadvantages therefore this study was set to determine how AI affects the MRI diagnosis accuracy and workflow optimization in India. As such, there is still very limited information on how such an integrated MRI learning system works in the Indian scenario since factors that lead to resource adoption are unique in this region. This work is aimed to fill the gap supporting this thesis by featuring the Indian healthcare context which is poorly investigated in terms of implementation of AI in MRI diagnostics.

1.2 Problem Statement

Although AI has advanced quite a bit, it has yet to penetrate the Indian market because there are various reasons for its attention, which are infrastructural deficit, regulatory binding, and lack of trust from medical experts. In addition, the utilization of AI is to be confirmed by empirical data for its efficacy in enhancing MRI procedure methodology as well as accuracy in the diagnosis in the Indian context of

healthcare. Research on the viability, impact, and acceptance of AI in emerging nations like India is lacking, as the majority of studies have concentrated on those where AI is now in use.

Consequently, this study aims to bridge this gap by evaluating the impact of AI-integrated MRI systems to enhance the efficiency of the workflow and accuracy of the diagnostic by MRI in India. This way it examines and observes how AI is being used and implemented by radiologists and also other healthcare professionals, common issues that arise with adoption and how prepared is the healthcare organizations to implement such technologies.

1.3 Aim and Objectives

Aim

The aim of this study is to assess how the deployment of AI in MRI systems affects diagnostic accuracy and workflow optimization in Indian health facilities.

Objectives

- To understand the reception to the idea of implementing AI in healthcare professions regarding the accuracy of MRI diagnostics, its usability, and its operation.
- To explore and review the current trend of AI tools used in MRI diagnosis to see the effectiveness in the performance of radiologists.
- To determine the benefits and risks of employing AI in MRI diagnosis, as well as possible issues arising from certain factors concerning regulative, ethical, and practical aspects.
- To evaluate the impact of AI-driven automation on workflow optimization in MRI procedures, focusing on scan time reduction, efficiency gains, and resource utilization in Indian healthcare facilities.
- To identify the challenges and opportunities associated with implementing AI in MRI systems across India, considering regulatory policies, infrastructure readiness, and acceptance among healthcare professionals.
- To offer evidence-based best practices to promote the effective use of AI-supported MRI diagnostic systems incorporating factors of efficiency, accuracy, and user satisfaction.

1.4 Research Questions

Q1. How is AI perceived by healthcare professionals regarding its accuracy, usability, and effectiveness in MRI diagnostics?

Q2. What are the current AI technologies being integrated into MRI systems, and how do they enhance diagnostic accuracy?

Q3. What are the major benefits and limitations of AI adoption in MRI diagnostics in India?

Q4. How does AI-driven automation impact MRI workflow, including scan times, efficiency, and resource utilization?

Q5. What are the key challenges and opportunities in implementing AI-integrated MRI systems in India's healthcare sector?

Q6. What best practices can be recommended for optimizing AI-driven MRI diagnostic systems in Indian hospitals?

1.5 Hypothesis

Alternative Hypothesis (H_1): MRI with the integration of AI greatly improves patient diagnostic possibilities and work productivity in comparison with traditional MRI.

Null Hypothesis (H_0): There is no correlation between the use of AI in the diagnostics of MRI scans and an improvement in diagnosis precision or in the time taken to perform the diagnoses within a clinical environment.

1.6 Significance of the Study

AI is making a revolution in the diagnosis of MRI. It also enhances the efficiency as well as the accuracy of diagnosing. This study works for several parties. More about the effects of AI is learned by healthcare workers. It is likely to impact the optimization of process and related decision-making (Singh *et al.,* 2024). Radiologists can increase their productivity. The regulators are aware of the difficulties of this process. An abstract on the ethics of AI adoption is brought up as a concern. An infrastructure recommendation to the hospital management is made. Approaches for resource allocation of AI are presented. Applications of AI benefit from the efforts of researchers. The study aims to develop methods in the field of medical imaging. India's healthcare setting is specifically considered. The results are used to make well-informed decisions about the deployment of AI.

1.7 Scope of the Study

This study intends to explore how AI is being deployed in computerized tomographic facilities in Indian healthcare to make MRI diagnoses. By considering the radiologist's viewpoints, hospital managers' views, and the legislator's views, it will explore the impact of AI in terms of improving

diagnosis accuracy and workflow efficiency. The study will be limited to MRI applications, where AI may be embedded into images taken from CT or X-rays, for instance. In addition, the study will follow hospitals and diagnosis centers that have already set up AI-driven MRI systems or are considering using AI-driven MRI systems.

1.8 Structure of the Study

In this research, it is structured as follows.

Chapter 1: Introduction

This chapter gives background information, research problem, objectives, research questions, and hypothesis besides the significance, scope, and structure of the study.

Chapter 2: Literature Review

Review of previous research on AI in MRI diagnostic analysis, including the beneficiaries and challenges of it and its trends in India.

Chapter 3: Research Methodology

This chapter discusses the research design, data collection methods, analysis to be adopted, and ethical matters.

Chapter 4: Data Analysis and Discussion

This chapter gives an overview of data collected and statistics describing user commitment to data management and visualization. Also, this chapter discusses the results concerning the existing literature and research objectives.

Chapter 5: Conclusion and Recommendation

Summarize the main findings, elucidate on implications, and recommend ways of best implementing AI in MRI diagnostics.

Chapter 2: Literature Review

2.1 Introduction

Artificial Intelligence (AI) integration in Magnetic Resonance Imaging (MRI) diagnostics has transformed the medical imaging status from a mere method to the field of technology offering more accurate diagnostics, removing human error and optimizing workflow efficiency (Oyeniyi and Oluwaseyi, 2024). Compared to traditional diagnostic tools including MRI, X-ray, CT scans, and ultrasounds that rely on the interpretation by radiologists, AI-enhanced MRI provides a better resolution and detects abnormalities better. Research into using AI in healthcare is underway, however, for such applications, still lots of work needs to be done about infrastructure issues, ethical concerns, and regulatory aspects (among others). This chapter critically analyses the corpus of work on AI in MRI diagnosis. It organises the discussion around the key themes identified in terms of the goals of the study, while covering regulatory and ethical issues, infrastructure readiness for the integration of AI, and how AI influences radiologists' decision-making. Thus, contributing to research in medical imaging, the study is placed in a theoretical framework and the literature gap is addressed through discussing which areas need more research.

2.2 AI and Its Impact on MRI Diagnostics

AI has brought about considerable improvements in image reconstruction, anomaly identification, and automated reporting, hence revolutionizing MRI diagnostics. Deep learning techniques, particularly convolutional neural networks (CNNs), enable these advancements to significantly speed and accuracy of MRI interpretation. According to Saeed *et al.,* (2023), radiologists now have a much higher ability to detect problems with greater accuracy and speed because AI has significantly decreased the chances of diagnostic errors by making machine tasks like detecting abnormalities automatic. The increasing faith in AI-assisted MRI scans is because they can aid medical practitioners in more accurate diagnosis of complex diseases. According to Gill *et al.,* (2023), the fact that AI systems are perfect diagnostic tools due to their speed, preciseness, and tremendously better picture processing and analysis speed than manual evaluations. The speedup of a diagnostic process, improvement of diagnosis accuracy, and finally better patient outcomes are the possibilities of these developments.

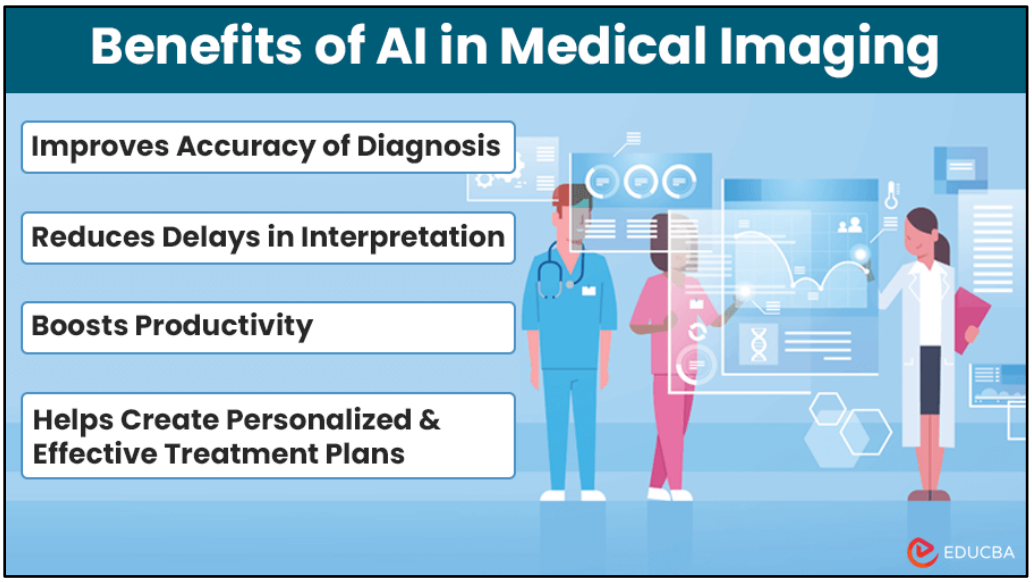

Figure 2.2.1: Benefits of AI in Medical Imaging (educba, 2024)

However, it is important to keep progressing to improve the integration of AI in analyse and trending of emergency MRI scans. The interpretability of the models developed through machine learning is one significant area that has been criticized greatly. According to Küstner *et al*. (2024), most of the deep learning-based AI systems are "black box" systems, meaning that the systems generate results without providing the rationale for their decisions. This lack of openness makes it difficult for radiologists to have faith in the stands that the AI is giving. Chauhan *et al*. (2024) also pointed out that it may become embarrassing for radiologists to surrender to technologies that do not reveal why certain decisions were made particularly when addressing life-threatening diseases. However, the drawback arises with the inability of AI to explain why it arrived at the particular conclusion based on the irregularities that it has detected with high accuracy. This means that addressing these issues through enhanced model interpretability and promoting cooperation between AI developers and doctors is the way to successfully establish AI in MRI diagnostics.

As it has been observed, AI has many applications for diagnostics that are quite effective; nonetheless, they should be implemented in association with human intelligence and not replace it. Therefore, even though AI could help signal signs of possible abnormalities and suggest a diagnosis to health practitioners, the final decision should be made by a trained radiologist (Tao, 2024). This approach ensures this cooperative approach will continue to heavily depend on human judgment in the diagnostic process. Medical practitioners could benefit from integrating the advantages of AI technology with their abilities to deliver more precise, more dependable, and faster diagnoses. According to Bekbolatova *et al.,* (2024), the fact that AI can be used to enhance rather than replace human capabilities in MRI diagnostics is an insurance to upholding technological confidence, while also

improving results. A well-rounded strategy for this maintains the human oversight that is essential to providing patients with top-quality treatment while still allowing for AI to contribute.

2.3 AI and Radiologists' Decision-Making

AI has significantly influenced the decision-making process of radiologists, offering a valuable tool that enhances diagnostic accuracy and supports clinical judgment. According to Chaurasia, (2023), in radiology, AI is utilized as a secondary opinion, by suggesting to radiologists recommendations generated on the technology so they can make more proper choices. Integrating AI possibly would help increase diagnostic performance in judgments of ambiguous anomalies in complex cases that are difficult to read manually. A study by Najjar, (2023), indicates that using an AI solution could help radiologists improve the detection of illnesses that might otherwise be missed when they reduce misdiagnosis rates by 15% to 20%, especially from MRI images. The decrease in mistakes shows how AI can improve patient care overall and the accuracy of diagnosis.

On the positive side, there are numerous benefits of AI integration in business processes, but there are the risks of being overwhelmed or dominated by it. According to Marey *et al*., (2024), dependence on AI systems that can provide recommendations makes radiologists prone to cognitive compliancy. Right now, what happens is that if radiologists start accepting AI-generated results without questioning them or using their professional judgment they are becoming complacent. According to Babarinde *et al.* (2023), an equally worrying case is that this dependence will limit the role of human expertise in the diagnostic process (Krishnamurthy *et al.,* 2022). Making complex decisions requires the clinical judgment of highly skilled and knowledgeable specialists, radiologists, who after long years of work and experience cannot fully be reproduced by the AI.

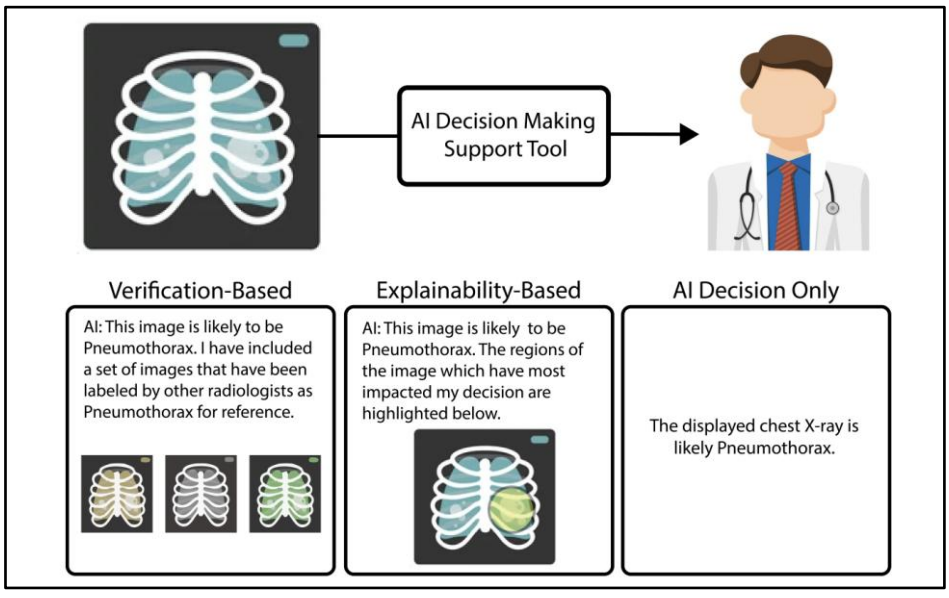

Figure 2.3.1: AI-Human Decision Modes (marktechpost, 2024)

Continuous training and education are needed on the part of the radiologists to minimize this risk. According to Venkatesan *et al.,* (2022), when it comes to AI tools, even training programs geared towards them should push the value of retaining professional competence in diagnostic skills. According to Rasool *et al.* (2024), it is essential to back up radiologists in critically reviewing the output of the AI while also maintaining the notable radiologist's clinical context knowledge, skills, and understanding in the way they decide (Khalighi *et al.,* 2024). The goal is not to replace radiologists but to be a good helping tool that would enhance radiologists' skills.

An integration of AI with MRI diagnosis should be done in a balanced manner. According to Ahmad *et al.,* (2021), the professional judgment of radiologists will be needed to ensure that AI is used to help complement rather than supplant their knowledge. A cooperative approach is upheld by AI to help radiologists provide the best patient outcomes and diagnostic accuracy. Radiologists can leverage the benefits of AI-driven technology along with its wisdom to develop a more consistent and effective way of performing diagnoses (Obuchowicz *et al.,* 2024). Overall, AI must be thought of as a helper in deciding by human judgment and enhancing the standards of care.

2.4 Regulatory and Ethical Challenges in AI-Based MRI Diagnostics

The ethical and regulatory concerns around AI integration in MRI diagnostics need to be addressed as it relates to safe and effective implementations. Khanna et al., (2020) explain that its most immediate problem is adherence to the recognized medical standards and regulations. The AI-driven diagnostic systems would have to be regulated by agents like the European Medicines Agency (EMA) as well as the Food and Drug Administration (FDA). However, the procedure for regulatory approval of AI-based medical devices is still in its infancy and there is a dearth of clarity on the process as there is no clarity in the still-developing procedure. In other words, it takes regulatory agencies to bring frameworks that would ensure that similar instruments are secure and effective while technically progressing (Kumar and Upadhyay, 2024). There is maintaining the right balance between becoming innovations and using AI for healthcare and protecting patient safety.

Besides regulatory considerations, ethical considerations of using AI in MRI diagnosis must also be taken into account. However, according to Joshi et al. (2024), the ethical concern of bias in AI systems is significant, as the datasets are predominantly trained on cases from specific demographic groups. Khan et al. (2024) note that this issue becomes particularly relevant when applied to populations that are not well represented in the data; thus, the resulting AI systems will likely be less accurate or efficient. For instance, AI systems trained on specific scenarios may struggle to make an accurate

diagnosis for patients from different ethnic or cultural backgrounds (Pillai, 2021). To address this problem, ensuring diversity and inclusivity in training datasets is critical to guarantee that the AI systems with which patients interact are both trustworthy and equitable for all patients.

Additionally, in the areas of healthcare, the application of AI often means collecting huge amounts of data, sometimes even moving them across various locations for processing, thus bringing up many issues on data security and patient privacy. According to Kasula, (2021), medical data is exceptionally sensitive and to use and protect the use, stringent security measures and open procedures are a must. As per the view of Kasula, (2021), to maintain public trust in AI technologies, it is important to gain the informed consent of the patients, rule out a precise definition of data exchange and storage, and protect anonymity. In summary, for AI to be responsibly applied in MRI diagnostics, these ethical and legal issues need to be resolved as the right application of this technology is both efficient and completely fair for every patient. In India, the "Central Drugs Standard Control Organisation (CDSCO)" regulates medical devices including those based on artificial intelligence. The Medical Devices Rules, 2017 which enlarged the scope of medical devices also provided that software intended to be used for medical purposes is also considered to be a medical device (FRANCONI, 2020). However, these guidelines adopted do not directly relate to AI features such as learning by experience and real-time ‘‘big data’’ processing.

Notably, the "Indian Council of Medical Research (ICMR)" responded to this concern with the ethical guidelines of artificial intelligence in biomedical research and healthcare in March 2023 (Bhargava et al. 2024). These principles include the basic principles that are autonomy, safety data or information, accountability, and informed consent. They also give a system for the design or establishment of AI technologies for healthcare, checking, and using phases. However, currently, it is still rather unclear whether this country has legal policies to strictly regulate the application of AI in diagnosis. Thus there are a number of difficulties in identifying the approval, regulation, and post-market surveillance of AI-based medical devices. Also, it is important to notice that the development of AI technologies is constant and requires constant regulation too.

2.5 Infrastructure and Resource Readiness for AI Integration in MRI in India

Magnetic Resonance Imaging (MRI) diagnostics with Artificial Intelligence (AI) integration has its requirements of being ready with significant infrastructure and resources (Anazodo *et al.* 2023). AI-driven MRI technologies provide better diagnostic accuracy, faster scan time, and optimized workflow. However, the implementation is based on healthcare institutions' support of AI systems. Challenges to AI adoption in MRI diagnosis in India exist due to limited available computational power, lack of data

sharing framework, insufficient internet connectivity, and lack of trained professionals. Gaps in this issue need to be tackled before we can widely implement AI in medical imaging.

One crucial aspect of integrating AI into MRI is having robust computational infrastructure. Because they rely on high-performance computing (HPC), particularly GPU and TPU resources, deep learning model artificial intelligence (AI) algorithms require large imaging datasets to analyse (Murali *et al.* 2024). But, many Indian healthcare institutions especially public hospitals and smaller diagnostic centers do not have the budget or expertise to invest in such sophisticated hardware. This limited access to AI-assisted MRI diagnostics remains a consequence of the fact that AI-assisted MRI diagnostics are only available to well-funded institutions. AI adoption is growing, which necessitates such investments in computational infrastructure and building AI models that run with acceptable efficiency on low-cost systems (Vahdati *et al.* 2024).

Similarly, data management and security are vital for fully connected AI-driven MRI systems. Due to the large amount of imaging data needed to train and validate AI models, data security and storage solutions become paramount, and these can be realized by cloud computing (Banerjee, 2024). Remote access to, and collaboration on, cloud-based platforms is enabled for cloud-based AI and remote access to searchable databases. However, challenges to cloud adoption exist because sensitive patient information must meet strict regulatory requirements such as HIPAA and India's developing data protection laws (Wuni *et al.* 2021). This adds to the complexity of AI integration, where the lack of a standardized data-sharing policy means we must codify data security, interoperability, and ethical data use.

The second crucial factor for AI integration in MRI diagnostics is high-speed internet access. MRI based on AI requires real-time image processing and collaboration through cloud computing, and these maintain the internet stable (Daye *et al.* 2022). In India, urban hospitals have the advantage of high-speed internet while rural and semi-urban healthcare centres face the problem of unreliability of connectivity. The digital divide restricts access to the use of such artificially intelligent MRI-based diagnostics in urban areas and prevents equitable distribution of modern medical technology. Government initiatives and private sector investment are vital for expanding digital healthcare infrastructure to make AI-based MRI systems available worldwide.

Another challenge in the adoption of AI for MRI diagnostics is the availability of skilled professionals (Kim *et al.* 2024). To use AI-powered MRI, you have to be able to read AI's generated insights and validate them. However, many of the radiologists would not have any formal training in AI and data science making their confidence in interpreting the AI-assisted diagnosis difficult. Furthermore, it is crucial to collaborate between radiologists and AI engineering teams to refine AI models to operational quality. Training of the interdisciplinary program and use of the radiology education structured to be

AI-focused with the certification courses will help in bridging the knowledge gap and effectively use in the AI radiology workflow (Shen *et al.* 2024).

A variety of financial constraints also prevent AI adoption in MRI diagnostics. With the high initial investment needed for AI MRI, there is the purchase of advanced hardware, licensing of AI software, and the training of personnel (Dash, 2023). Therefore, many government hospitals and small private clinics which form a large chunk of healthcare institutions in India find it difficult to integrate AI due to budgetary limitations. Financial barriers can be addressed through public-private partnerships, government subsidies, or research grants which lower the cost and make more affordable and accessible AI technologies (Jain *et al.* 2021). Funding in support of AI-driven healthcare innovations will advance adoption and the quality of patient care.

2.6 AI's Contribution to Advancements in Medical Imaging Research

AI has had a huge impact on medical imaging, particularly in MRI diagnostics, and has helped create breakthroughs that improve the precision and effectiveness of diagnostic procedures. As per the view of Panayides *et al.,* (2020), it's important here to note that advances in picture reconstruction and segmentation as an approach to making a more accurate diagnosis, are particularly valuable in cardiology, neurology, and oncology. On the other hand, according to Buaka and Moid, (2024), for disease diagnosis and monitoring, MRI is vital in these fields, and advances in the AI world allow the identification of abnormalities at the early stage with higher accuracy. This allows medical practitioners to make more educated choices so that better patient outcomes might be achieved.

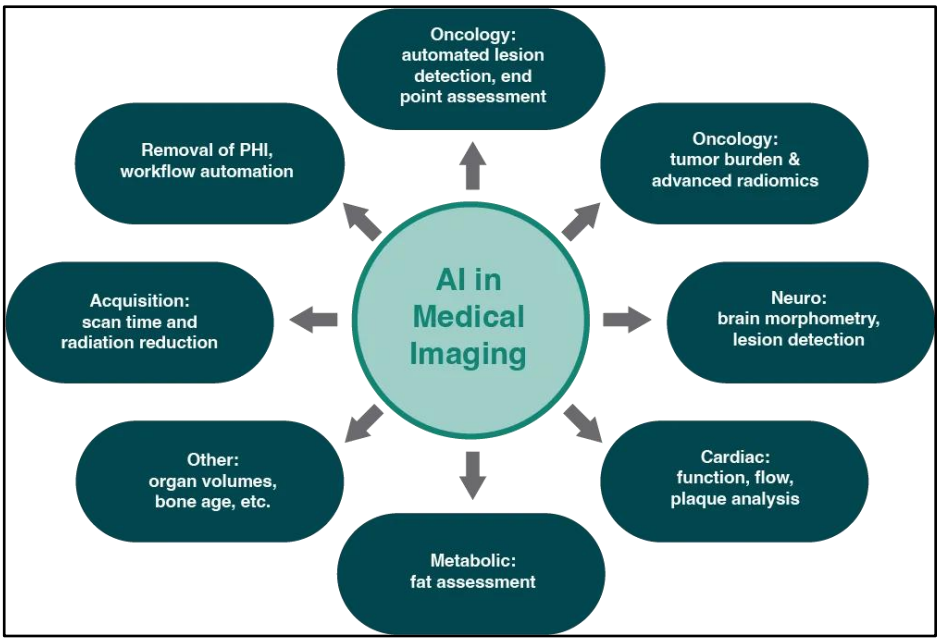

Figure 2.6.1: Integration of AI in imaging clinical trials (ddw-online, 2024)

Other than its capacity to process vast medical images and identify patterns that are invisible to the naked eye, a significant increase in the importance of AI in medical imaging is in that it can search a large number of medical images. According to Mese *et al.,* (2023), automating the repetitive operations and identifying important parts in the image reduces the radiologists' workload to provide better clinical procedures thus it has aided with the use of AI. On the other hand, as per the view of Najjar, (2023), it is particularly important in the high-demand setting where prompt medical picture processing is imperative. This means AI can also be used to help medical professionals make better decisions by providing additional information and getaway pictures resulting in more forecasts, which could help track a disease's course as well as improve accuracy in diagnosing a disease.

Although these developments allow for the broad use of AI in MRI diagnoses, there are still problems with the research uniformity. According to Yang *et al.,* (2024), dataset quality, algorithm performance, and model training are cause for creating institutional differences, which then threaten the reproducibility and dependability of AI models. These variances may limit the generalizability of AI-based solutions and thus result in differing diagnostic results from those retrieved by a pathologist. Moreover, as per the view of Penzkofer *et al*. (2021), the current enhancement of the reproducibility and reliability of AI models is achievable with datasets and validated measures. This will ensure that the medical community will be more susceptible to and comfortable with the use of AI technologies as AI will be continuously used in clinical settings and AI research is more reproducible.

2.7 Conceptual Framework

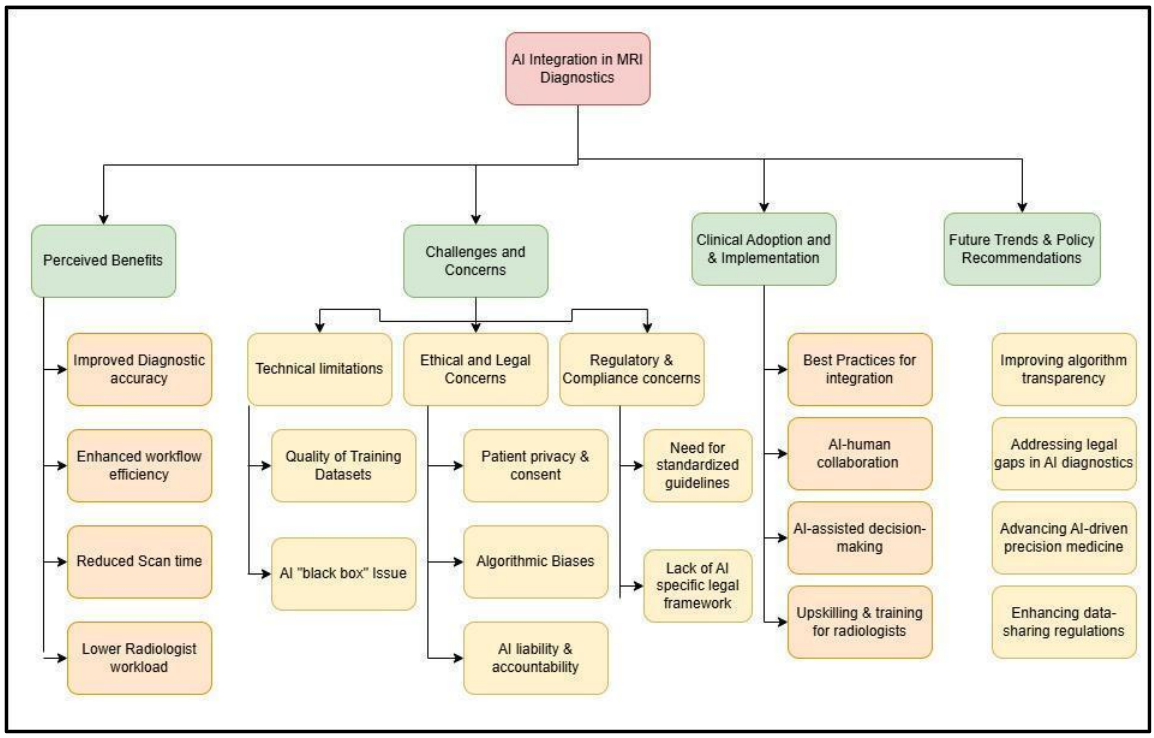

Figure 2.7.1: Conceptual Framework (Self-created)

2.8 Theoretical Framework

Various theories can be brought to look at the use of AI in MRI diagnostics. The use of AI by radiologists and healthcare managers faces the perceived utility and ease of use as stated by the ***Technology Acceptance*** *No table of figures entries found.****(TAM)*** (Nirapai, and Leelasantitham, 2024). Trust and perceived dependability are needed to facilitate the adoption of AI in medical imaging. Another important concept within the field of AI adoption is the ***Diffusion of Innovations Theory (DOI),*** which helps explain how the spreading of AI in healthcare developments goes. Success happens when legislative and infrastructural readiness is in place, and large hospitals and other early adopters usually set that precedent (Williams and Duff, 2024). In addition, the ***Ethical AI Framework*** covers responsibility, transparency, and justice and concludes with data protection and bias reduction in AI medical diagnostics. When these theories are applied together, there's a comprehensive picture to understand how AI is helping everyone with MRI diagnoses (Górriz *et al.,* 2023).

2.9 Literature Gap

While significant research has been made regarding AI in MRI diagnoses, there are still a couple of holes in our understanding. According to Pesapane *et al.* (2024), firstly, the research in the context of AI deployment in Indian healthcare has focused on Western systems and little is here studied in the

Indian context. There are also no longitudinal studies that assess the long-term effects of AI on radiologists' diagnostic accuracy or decision-making (Bhalla *et al.,* 2024). However, the study into ethical matters is almost non-existent, particularly regarding bias prevention issues. In addition, there is not enough knowledge about whether or how well training programs for radiologists, incorporating AI in their work, work. Finally, the lack of standardization of AI across the institutions causes a hurdle in generalizing the results in terms of variation in the models and evaluation measures. It is crucial to fill these gaps to be able to use AI ethically and effectively in MRI diagnostics.

2.10 Summary

This chapter has evaluated the body of research on the role of AI in MRI diagnosis with a focus on the effects on radiologists, regulatory issues, infrastructure preparedness, and contribution to the research in medical imaging. However, AI has a long way to go before it can offer an end to the speed and accuracy problems of disease diagnosis. The theoretical framework assembles TAM and DOI models in conjunction with the ethical AI model and argues about the dynamics of AI adoption. The gaps in the literature indicate the region that needs further study, especially in terms of Indian healthcare, the long-term effects of AI, and the standardization hurdles. The remaining chapter will cover the approach used to investigate these problems.

Chapter 3: Methodology

3.1 Introduction

This section describes the method used in the research focusing on the effect of artificial intelligence on diagnostic ability in MRI. The purpose of this chapter is to outline and defend the research philosophy, approach, design, data collection, strategies, and analysis procedures utilized in the study. In addition, this chapter has also provided inclusion and exclusion criteria for participant selection and summarizes the ethical issues of the study procedure. In the chapter, the technique is proved to be sound, legitimate, and consistent with the goals of the study taking into account these elements. The chapter provides details to ensure the validity and trustworthiness of the research; details that include a thorough explanation of the selected research methodologies and their validity.

3.2 Research Philosophy

Research philosophy is the underlying belief system that is in use by the researcher in the research process as well as in viewing the world or rather understanding the world of the researchers. These are beliefs that reality is measurable with objective and observable by the researcher. Hence, this philosophical position involves fact-finding i.e. using measurements with objective numbers, data, and empirical evidence while interpreting why phenomena exist (Sadeghi et al., 2022). According to Positivism, reality exists beyond us and can be quantified and if we are to know whatever about reality, we can do so through the instruments of the senses.

In terms of the positivist philosophy, this study is unique because it is aimed at investigating if artificial intelligence (AI) affects MRI radiologists' diagnostic accuracy to reasonable accuracy. Since the purpose of this research is to better explore how AI technology affects diagnostic outcomes, positivism is strategically fit to further discuss these impacts. When looking at the use of AI systems in the healthcare area, the assessment is mostly carried out by taking empirical data, and most often through KPIs, diagnostic accuracy, error rate, and the effectiveness of AI-supported recommendations.

This research intends to explore the impact that AI plays into the decisions that a radiologist makes and the performance of those who do the diagnosis, employing a positivist approach that would provide quantifiable data of causal relations (Syer et al., 2021). Objective measurement and analysis of such variables as diagnostic speed, accuracy, and reduction of misdiagnosis rates are possible. In addition, the study results can also be observed through the use of the positivist approach in terms of seeing if there are correlations between the AI integration and the changed performance of diagnoses so that the results paint a clear, relatively statistically reasonable picture.

Justification

This research is appropriate for positivism because the study wishes to acquire measurable and objective data to determine the effect of AI on radiologists' diagnostic performance. However, as a philosophy, it permits the use of standardized tools to collect or yield the use of standardized tools to collect or yield comparable and accurate data in several settings. This aligns with the study's goal, which is to quantify how good healthcare AI is via objective measures such as diagnostic error rates and the accuracy with which AI-driven recommendations are made (Anichini and Kotras, 2024). Although this research cannot be proof of the adoption of positivism resulting in the quantification of the role of usage of AI in the enhancement of MRI diagnostic outcomes with further conclusions to its application in clinical practice upon informed decisions, this research can generate the empirical evidence of the quantification of the role that AI plays in the improvement of MRI diagnostic outcomes itself. The approach is also useful in making data interpretation transparent and in giving consistency of interpretation that would lead to the reliability and validity of the finding.

3.3 Research Approach

This research follows a deductive approach, it starts with a deduction or hypothesis the test is the data collection and analysis. In the research, they hypothesize that AI helps significantly in the reading of MRI scans as well as getting radiologists to make decisions so as they do the MRI scans (Jiang et al., 2021). The choice of its deductive technique is because it can assess whether an accepted hypothesis that determines the role of AI tools in diagnostic imaging, namely the effect of AI tools on the performance of radiologists, is true. The deductive method uses the existing literature available to find precise questions and hypotheses. Empirical data collected through the experience of radiologists using AI technologies to assist with MRI diagnosis is then tested on these theories. The procedure follows the standard scientific procedure and allows behaviour methodically about causal relations between AI tools and the diagnostic outcomes.

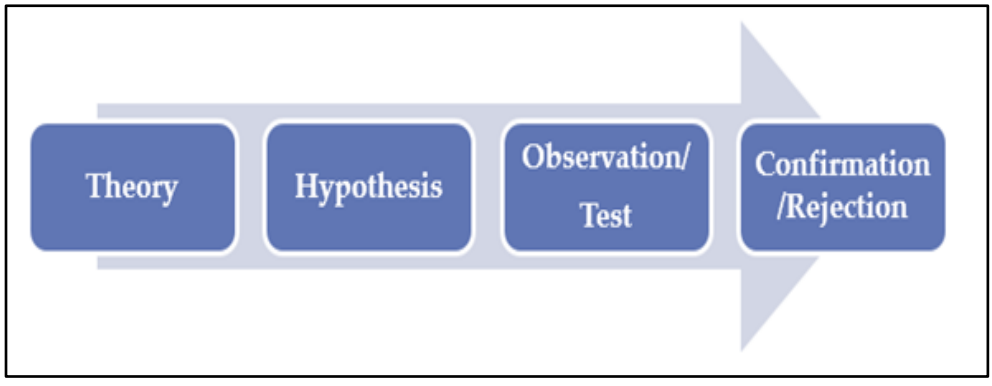

Figure 3.3.1: Deductive Research Approach (research-methodology, 2024)

Justification

This study can adopt a deductive approach as it will help test previously formulated hypotheses of artificial intelligence in healthcare, specifically in medical imaging. The method enables systematic examination of how AI affects the radiologists' diagnosis and judgment. This process makes clear and quantifiable predictions and the evidence proves or disproves these theories. It organizes such testing of theoretical frameworks in practice and ensures trustworthy and transparent results (Rouvière *et al.,* 2023). Having a strong deductive method to understand the consequences of AI on clinical practice, and to analyse the impacts that AI brings to decision-making and diagnostic accuracy, is useful. In this way, the study can contribute towards the improvement of the theoretical foundation of healthcare technology which can inspire more understanding of how AI is used in the real world, in radiology.

3.4 Research Design

Research design presents the framework in which the study will collect the data, analyse, and interpret it. A quantitative research design is used for the research of this study so that it can be employed to examine the quantifiable effect of AI on radiologists' diagnostic abilities. To obtain numerical data on the precision, efficacy, and efficiency of AI technologies in MRI diagnosis, surveys, and performance evaluation are used. To implicitly describe how artificial intelligence impacts diagnostic results, a quasi-experimental methodology will be used. This design is appropriate because it allows for gathering data in real-world environments where radiologists routinely employ the use of AI-powered instruments (Zaharchuk and Davidzon, 2021). Since cannot randomly assign individuals to randomization in this case, with the quasi-experimental design we can make some comparisons to see how well AI plays in clinical decision-making.

Justification

A quantitative research approach can use such objective, numerical data that may be examined statistically. A special use of this design is to test theories on how AI may influence decision-making, decision accuracy, diagnostic precision, etc. A quasi-experimental method was chosen to evaluate AI technologies in clinical situations in a realistic way and to meaningfully compare the group of radiologists (Rezazade *et al.,* 2023). Such a strategy enables the research to generate findings to be applied to real situations.

3.5 Data Collection Method

Data collection, an important part of the research process, because it provides the raw data necessary to test the hypotheses and provide answers to the research questions. In this study, surveys were used to gather primary data. AI-driven MRI technologies will be used by radiologists who will be given surveys and then their performance will be evaluated against the precision as well as the expected diagnosis.

The survey aims to find out the opinions, attitudes, and experiences with AI in prognosis by MRI radiologists (Chang *et al.,* 2022). It will contain closed-ended questions such as multiple-choice questions that will help it gather qualitative insights. Radiologists will be prodded about the use of AI in decision-making, the perceived rise in diagnostic accuracy and this confidence in the accuracy of AI systems. Radiologists diagnose a series of MRI scans as part of the performance evaluation; some are evaluated with AI techniques, while others are not. To evaluate accuracy, the diagnostic findings will be compared with a gold standard that consists of verified diagnoses.

Sample Size

Sample size refers to the number of observations needed in a study to represent a population. It ensures reliable inferences by controlling the margin of error. The equation for calculating sample size is shown below.

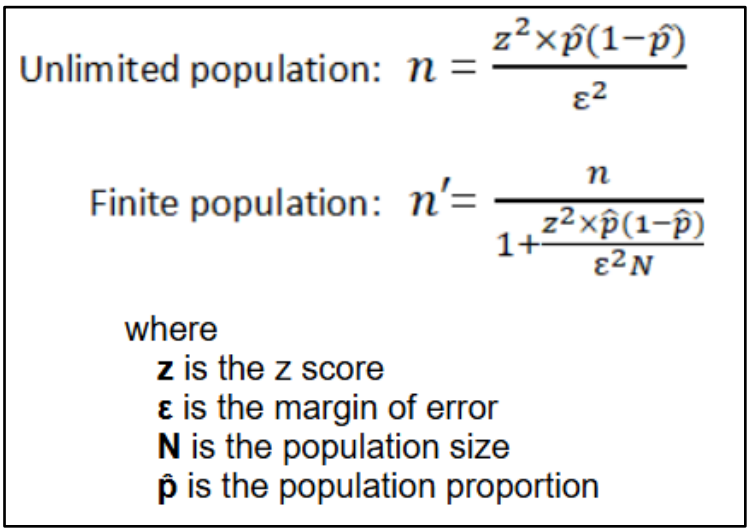

Figure 3.5.1: Sample size calculation formula

(Source: https://www.calculator.net/sample-size-calculator.html?type=1&cl=95&ci=5&pp=50&ps=1438100000&x=Calculate)

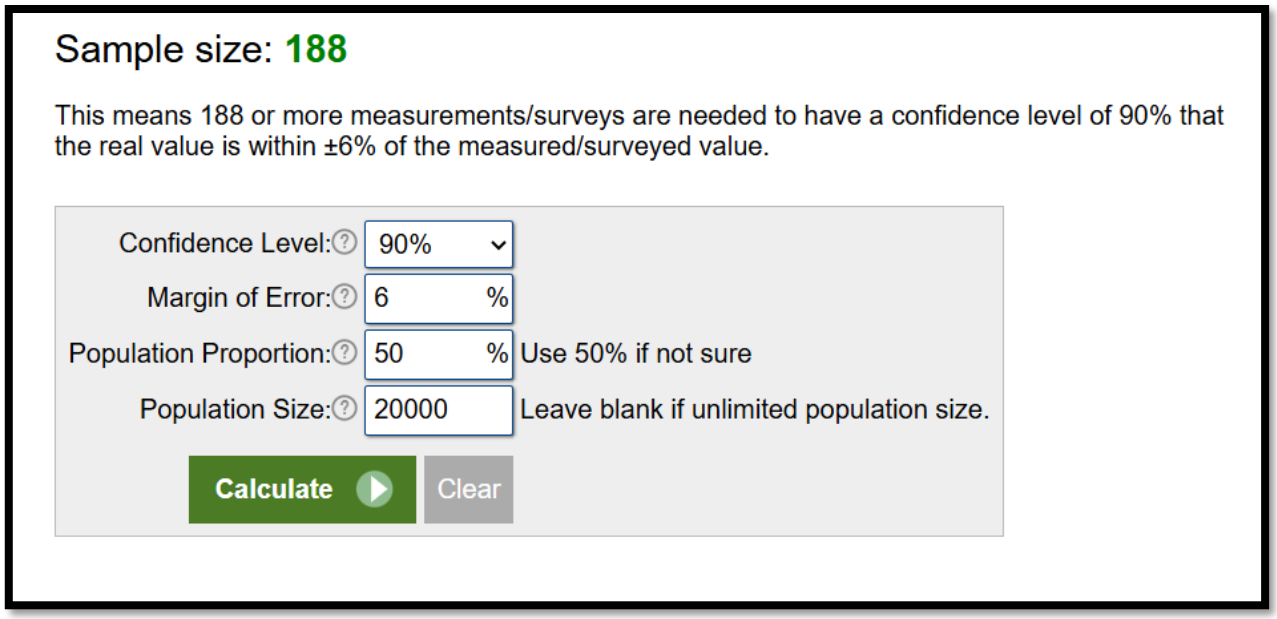

Figure 3.5.2: Determined Sample Size

(Source: https://www.calculator.net/sample-size-calculator.html?type=1&cl=95&ci=5&pp=50&ps=1438100000&x=Calculate)

The survey needs a sample size of 188 to have a confidence level of 90% that the real value is within ±6% of the measured/surveyed value.

Justification

The survey is an appropriate method of collecting data from a large number of people, which is ideal for obtaining information regarding the experiences or perceptions of radiologists. The combination of quantitative and qualitative questions will provide both fact-based and subject-based insights on how AI influences the making of radiologists (Alomari and Soh, 2023). Unbiased indicators for assessing how AI alters diagnostic efficiency and accuracy are needed to be able to make direct comparisons between conventional and AI-assisted diagnostics.

3.6 Data Analysis

The data collected through the Google Forms survey will be analysed using pie charts and bar diagrams generated for each question. This will help create a clear breakdown of the response distributions

through these visual representations that will let us get insights into the trends, patterns, and variations in the dataset using an intuitive way. Therefore, the use of a charts makes it easy to see the differences between different response categories and thereby makes it easier to see how AI has affected MRI diagnostic and radiologists' decisions. The study details the insights of respondents in the use of AI to assist in diagnoses, accuracy boosts, and challenges as well as their trust in AI recommendations. Each chart will be studied to learn which fraction of different responses and maximum common and important variance perception (Van et al., 2022). It permits a structured comprehension of the data for use in examining AI's role in medical imaging.

Justification

One of the most efficient and convenient ways of visually presenting survey responses to easily identify important trends and patterns is through the use of pie charts for data analysis. Because the study analyses quantifiable data of AI in MRI diagnostic, it helps to summarize the results simply without statistical computing. The pie charts also allow the presentation of the data in such a way that the findings can be better compared and discussed. Relative merits of this approach are that the survey awareness is wide, it is easy to assimilate, and it provides an objective conclusion regarding AI influence in medical imaging (Khalifa, and Albadawy, 2024).

3.7 Inclusion and Exclusion Criteria

For the study to be run with relevant and representative participants, inclusion and exclusion criteria must be set. This study will include criteria such as the following:

- Qualifies persons with at least two years of experience in MRI diagnostic radiology.
- However, AI-infused MRI tools are in use by some radiologists.
- The willingness and ability to do that is for those who will sign their informed consent, do the survey, and assess performance.

The exclusion criteria are:

- Those radiologists who do not use AI-assisted tools in MRI diagnostics.
- The Radiologists who are training or who are experienced for less than two years.
- Participants who cannot perform the performance assessment or complete the survey because of a technical or personal issue.

3.8 Ethical Consideration

Especially so in the field of healthcare where the participants' right to privacy, confidentiality, and security of related data is paramount, it is essential to pay proper consideration to research ethics. Doing this, will uphold the rights and confidentiality of any research participants involved in the study according to the highest ethical standards. Every participant will obtain their informed permission obtained, fully informed about the study's objectives, procedures, and possible dangers. The participants in this study will be reassured that their involvement is voluntary and that they can stop at any time without incurring any fees (Chi *et al.,* 2022). Confidentiality will be guaranteed by anonymization and safe storage of the data. Personal information and any identifiable information shall be kept apart from the data analysis to maintain privacy. Additionally, the study will hold to the rules set by institutional review boards (IRBs) and data protection guidelines, like HIPAA in light of the United States of America or GDPR in the case of Europe.

3.9 Summary

Extensive discussion has also been provided, for example, on the research concept, approach, design, data collection strategies, and analytic procedures. The study has been designed quantitatively through questionnaires and performance evaluations in collecting data and it employed a positivist, deductive approach. Statistical analysis will be used to assess how AI changes the way radiologists make decisions and how precise they are while making those decisions. Ethics issues like informed consent and confidentiality conformed well to the study. The motivation for this methodology is to solve the research problems for the information provided in AI at MRI diagnostics.

Chapter 4: Data Analysis and Discussion

4.1 Introduction

In the present chapter, it discusses the results of the Google Survey concerning the perceptions, awareness, and readiness for AI-assisted MRI diagnostics in healthcare. As more organizations need the diagnosis of imaging studies to be done faster and with higher accuracy, AI is rapidly developing into a crucial technology. The survey is aimed at assessing respondents' awareness, attitudes, trust, and ethical perceptions of AI in radiology. In this chapter, patients and healthcare preferences for adopting AI are presented through the pie-chart analysis of two trends. It is vital to know not only the current degree of acceptance but also the institutional, technological, and human factors in enabler that subsequently leads to the improvement of patient-centric and ethically valuable diagnostic services.

4.2 Data analysis

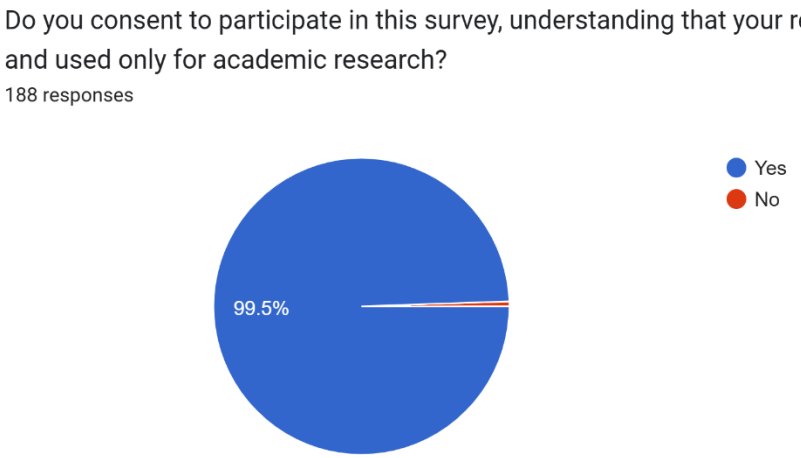

Figure 4.2.1: Visualization of consent response from the participants

(Source: Collected Via Google Survey)

There are 188 total responses received from a consent question in the survey conducted as shown in the image. A pie chart is another graphical presentation that shows the proportion or percentage distribution of the responses. Even when illustrated by the large blue segment labelled "Yes", 99.5% agreed to the proposition. On the other hand, 0.5 percent of the participants did not consent, as shown by the small red part on the figure. This translates to approximately 187/188 of the respondents affirming to participate while only 1 respondent declined. As from the data, the level of interest of the respondents to participate in the anonymous survey for academic purposes is high.

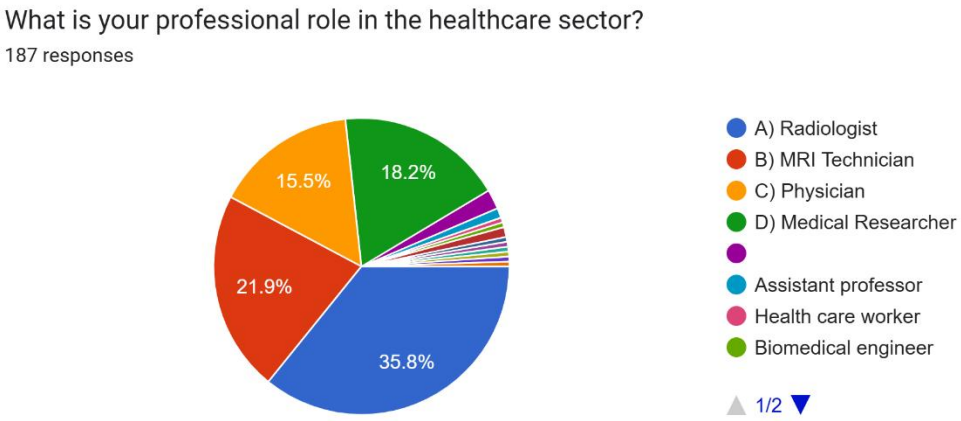

Figure 4.2.2: Visualization of response on professional role

(Source: Collected Via Google Survey)

The above pie chart represents the position of 187 respondents in the healthcare industry. The largest group is radiologists with 35.8% of the total number of staff; Subsequently, 21.9% of the patients claimed to be MRI Technicians while 18.2% as Medical Researchers. Physicians represent 15.5% of the respondents, a few other parts, each in proportion to the one described beforehand but with lesser proportionality, include Assistant Professor, Healthcare Worker, and Biomedical Engineer, and the likes not tagged with exact percentage on this presentation. The distribution also shows a high proportion of respondents belonging to the radiology staff and other positions in the medical field and research.

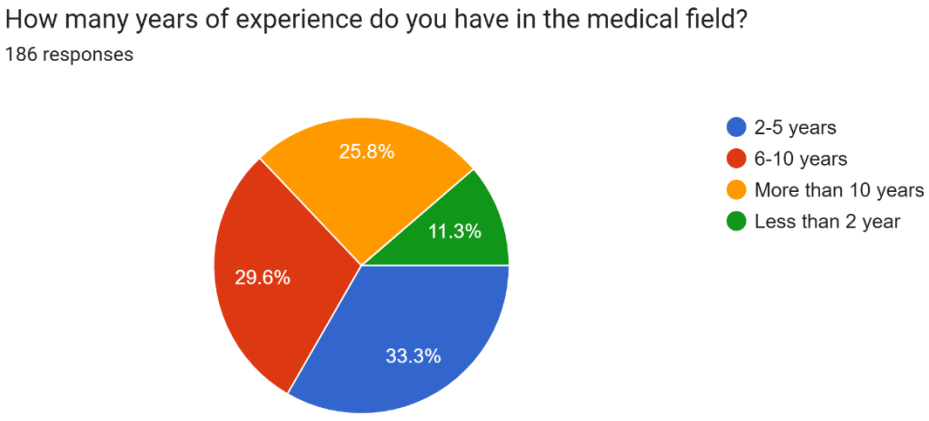

Figure 4.2.3: Visualization of response on working experience in years

(Source: Collected Via Google Survey)

The pictorial representation in a pie chart shows the years of experience in the field of medicine of all the 186 participants. The largest proportion of respondents with 2-5 years of experience make up 33.3%

of the clients. Next, there is 29.6% of patients with 6-10 years experience in having this disease. Still, 25.8% mentioned that he or she has had more than 10 years of experience in the medical field. The minimum share is 11.3% of respondents, and the majority of them have less than 2 years of experience. This distribution shows a somewhat even concentration of experience level of the survey participants; however, they are rather closer to the intermediate level.

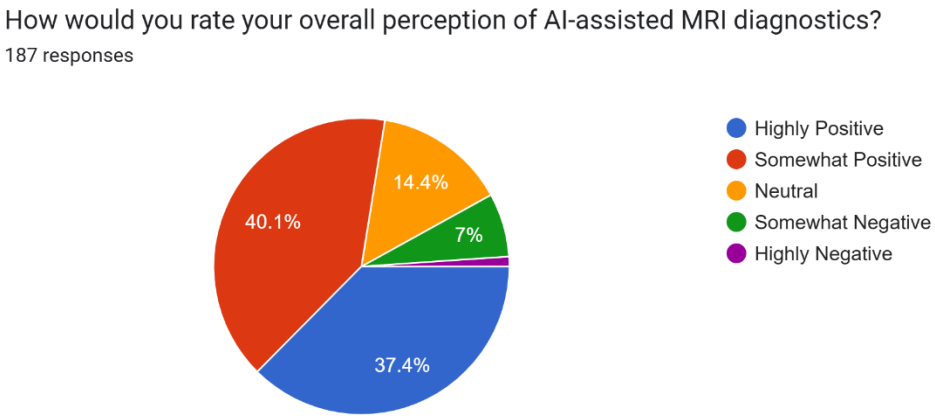

Figure 4.2.4: Visualization of response on precepstion on AI application in MRI diagnostics

(Source: Collected Via Google Survey)

The pie chart presented below shows the general attitude of 187 respondents towards the MRI diagnosis with the help of Artificial Intelligence. A significant portion, 40.1%, holds a "Somewhat Positive" view. Second, to that, 37.4% of participants possess a “Highly Positive” attitude toward such a ride. A smaller segment, 14.4%, feels "Neutral" towards the technology. Few people have “Somewhat Negative” attitudes: 7% while only a few have a “Highly Negative” attitude towards the topic: 1%. Overall, it is possible to state that the respondents harbour a positive attitude towards MRI diagnostics supported by artificial intelligence in this case.

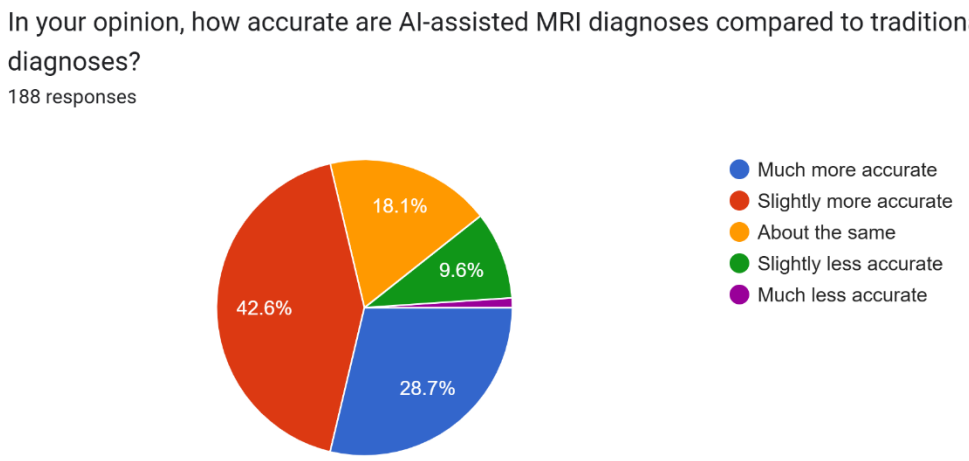

Figure 4.2.5: Visualization of response to the accuracy of AI diagnosis compared to traditional

(Source: Collected Via Google Survey)

This pie chart illustrates an overview of the actual and expected level of AI-assisted MRI diagnosis in contrast to the traditional methods; which 188 participants completed. A significant forty-two point six percent agrees with the statement that states: ‘‘It is Slightly more accurate.” After this, 28.7% regard it as ‘Much more accurate’. A significant percentage of 18.1% still believe that the accuracy of lemon discrimination is still “About the same.” The level of agreement with the statement ‘AI is less accurate’ is considerably lower where 9.6% of the respondents select ‘Slightly less accurate’ while only 1.1% select ‘Much less accurate’. The particioants stated that across all the scans, patients had a favourable impression that the AI-assisted MRI diagnoses were as good as or even better.

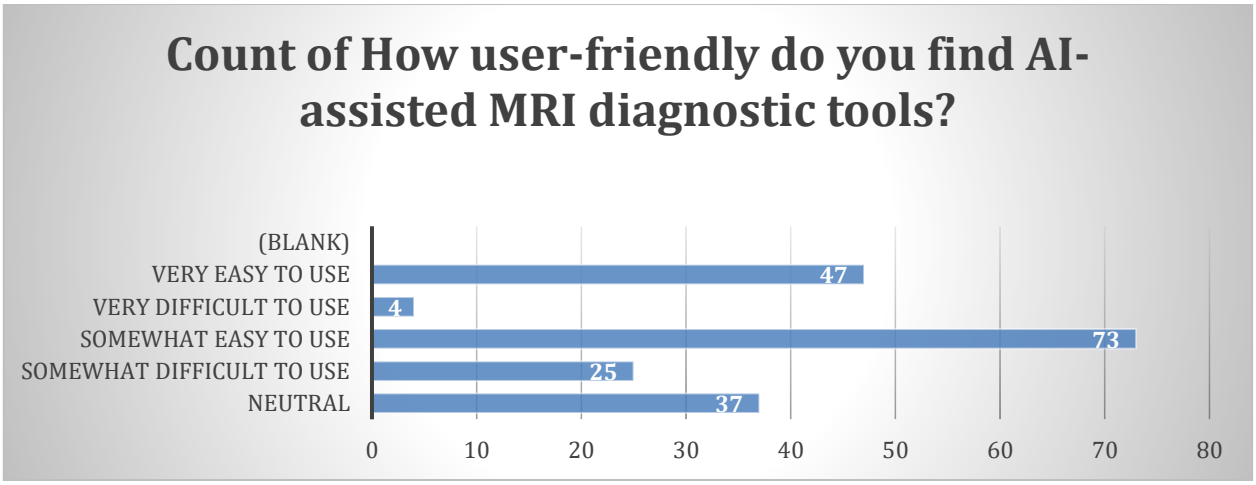

Figure 4.2.6: Visualization of Response on User Friendliness of the AI-assisted MRI

(Source: Collected Via Google Survey)

The following bar chart displays the level of user-friendliness of AI penetrative MRI diagnostic tools by the respondents 186 participants. The largest percentage 39.2% describes the tools as “Somewhat easy to use.” After this, 25.3% of the participants describe them as “Very easy to use.” A significant percentage, 19.9% are in a “Neutral” position when it comes to the ease of using the phones. However, 13.4% think that the tools are “Somewhat difficult to use”, while 2.2% think that the tools are “Very difficult to use”. In general, the answers point to a rather positive attitude to the perceived ease of use of these AI-supported tools where the vast absolute majority of respondents stated that the use of the respective tool is easy to some extent.

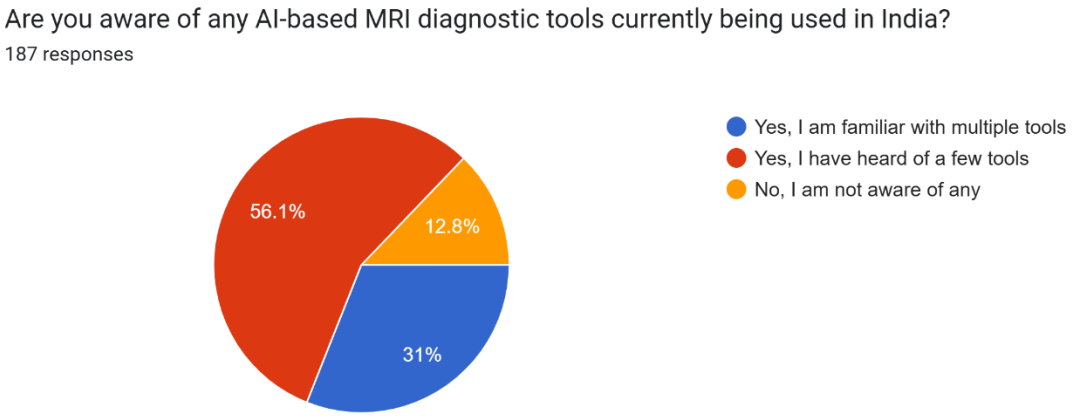

Figure 4.2.7: Visualization response on awareness of AI-based MRI diagnosis tool

(Source: Collected Via Google Survey)

The above pie chart highlights the degree of awareness about the AI-based MRI diagnostic tools that are used in India from the responses of 187 participants. The largest percentage which is 56.1% showed that they had heard of a few of such tools. After this, 31% of them are aware of multiple tools. A lesser percentage, which accounts for 12.8%, indicates that they are not aware of any AI-based MRI diagnostic tools being deployed in India. Based on these responses, it could be deduced that more than half of the participants are aware of at least a couple of innovations in applying AI in MRI diagnostics in the country.

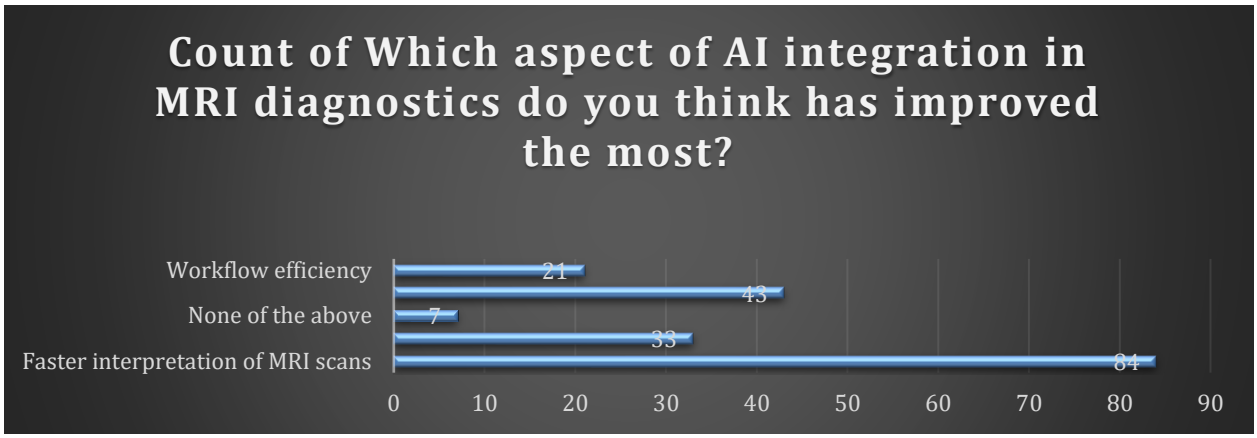

Figure 4.2.8: Visualization Response on AI intergradation improved the particular aspect

(Source: Collected Via Google Survey)

This bar chart shows which of the 188 participants surveyed they think has benefited most from the integration of AI in MRI diagnostics. The best change, 44.7% of the respondents noted, is the better "Speed in the interpretation of the MRI scans." After that, 22.9 percent of the respondents said that the area that has improved most is 'Reduced human error.' The "Image reconstruction quality" is stated as the area that has benefited most from AI by 17.6% of participants, while 11.2% responded that 'Workflow efficiency' is such an area by parts. Only 3.7% of the respondents agree with the statement, 'of the above' aspects have experienced the most improvement. All in all, the results suggest that the improvement in the speed of interpretation is the one that participants have associated with a more favourable change brought about by AI in MRI diagnostics.

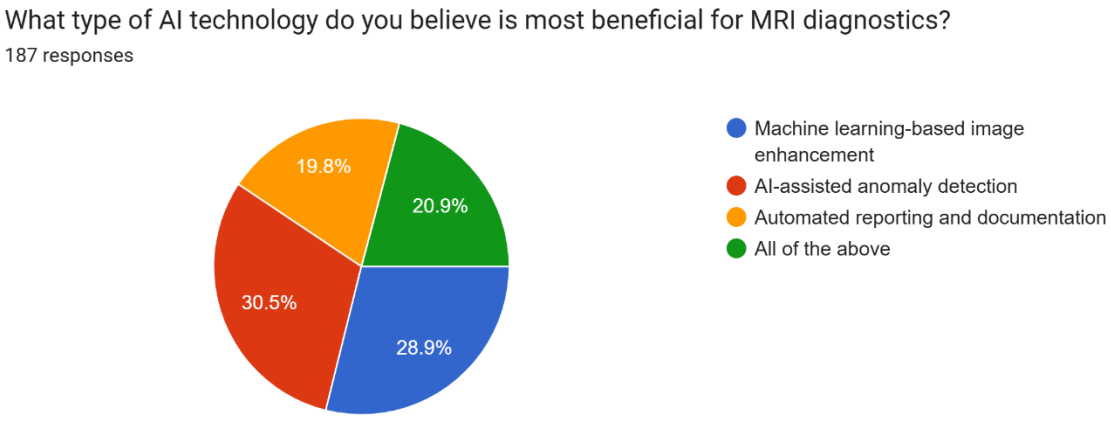

Figure 4.2.9: Response to most beneficial AI technology in MRI

(Source: Collected Via Google Survey)

The pie chart in the figure depicts the percentage of 187 respondents who responded to the question regarding which AI technology will be most beneficial for MRI diagnostics. The largest percentage 30.5% of the population states that ''AI-assisted anomaly detection" is more useful. Next to it, 28.9%

for “Machine learning-based image enhancement’’ received the highest perception of having the most benefit. As for the option, “Automated reporting and documentation”, it was chosen by 19.8% of participants. Of the 444 respondents 109 stated that all of the mentioned AI technologies are most beneficial 20.9 percent. That is a clear sign that such belief is placed in using AI to check out the anomalies from MRI scans besides improving on the image quality and the automation of administrative tasks.

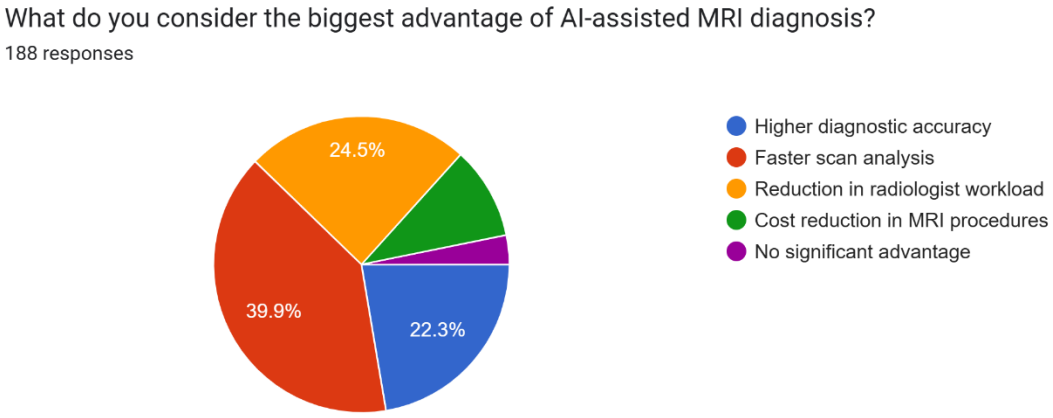

Figure 4.2.10: Response on advantage of using AI base MRI diagnosis

(Source: Collected Via Google Survey)

The pie chart below shows the survey respondent’s evaluation of the greatest benefit of AI in diagnosing MRI 188. The biggest advantage is “Faster scan analysis” taken by 39.9% of the participants. After that, 24.5% said they agreed with a “Reduction in the workload of the radiologist.” Responding to the questions about the perception of value, 22.3% of the respondents believe that “Higher diagnostic accuracy” has the largest advantage. A considerably smaller percentage of 8.5% believe in “Cost reduction in MRI procedures.” Finally, only 4.8% of the participants believe in the statement “No significant advantage”. Based on the findings, speed of analysis and decrease in burden are seen to be the two major advantages of using AI in MRI diagnosis.

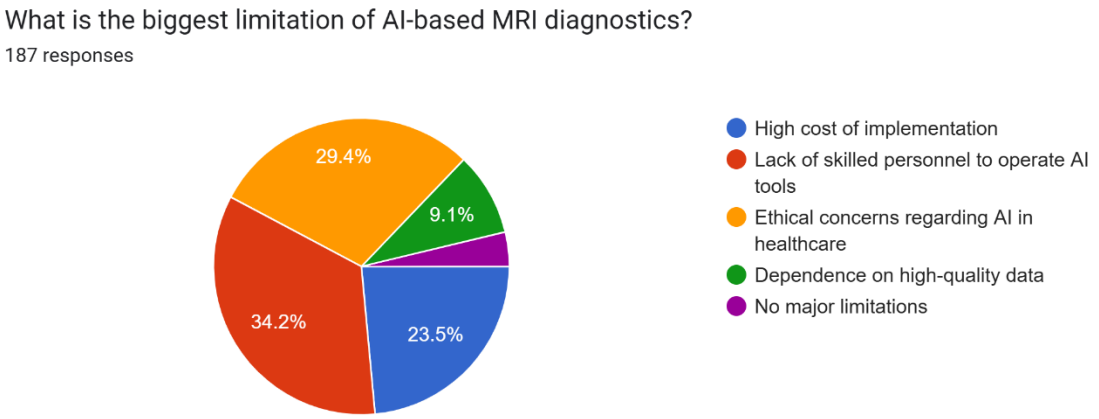

Figure 4.2.11: Visualization on the response of limitation of AI base MRI

(Source: Collected Via Google Survey)

The pie chart above shows how many of the 187 respondents identified the most significant drawback of using AI in MRI diagnostics. The largest mentioned barrier is lacking, for the 34.2 %, as “there is not enough skilled labour force to run AI tools.” Second to this, 29.4% of the respondents pick “Ethical issues of AI in the health sector” as a major drawback. As many as 23.5% of the respondents pointed out that the “High cost of implementation” was a key factor. A smaller portion, 9.1%, points to "Dependence on high-quality data." As for major limitations, only 3.8% of the participants think that there are none at all. These include a lack of skilled personnel in the diagnosis process, and ethical concerns as the two most severe perceived barriers to implementing the use of AI in MRI diagnosis.

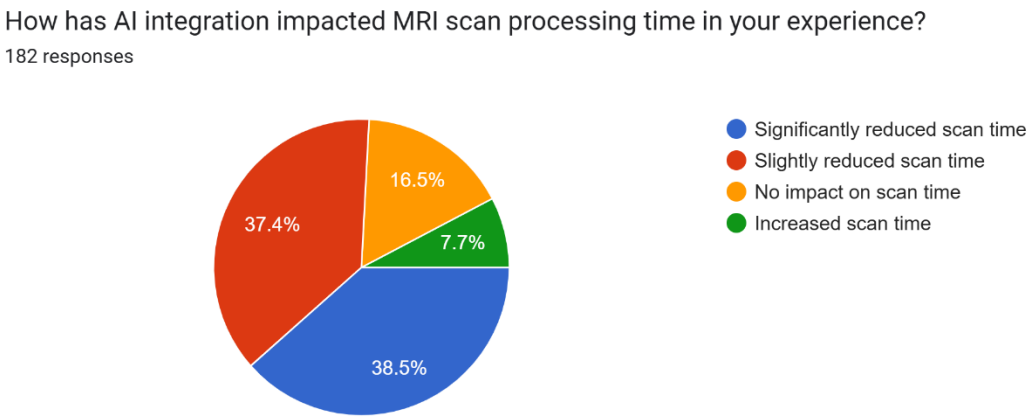

Figure 4.2.12: Response of Impact of AI-based MRI

(Source: Collected Via Google Survey)

This pie chart shows the distribution of the respondents about the perceived effect of AI implementation on the processing time of MRI scans based on 182 participants. The degree of

realization of the aimed improvements was quite high and as many as 38.5% of respondents reported that they experienced a ‘’Significantly reduced scan time.’’ Next to that, 37.4% of the participants chose the answer “A Slightly reduced scan time.” A smaller portion, 16.5%, observed "No impact on scan time." Staggeringly, only 7.7 % of the respondents said that their “Scan time” had been affected negatively and their response indicated that it had “Increased.” In general, the survey evidence points clearly to a positive view of the impact of AI on MRI scan processing time where most of the respondents found their time reduced on average.

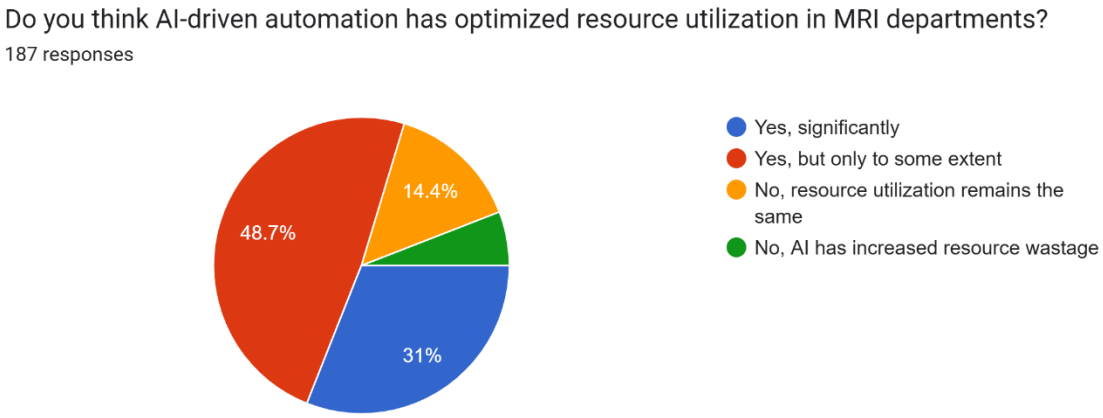

Figure 4.2.13: Response to Resource Optimization

(Source: Collected Via Google Survey)

The pie chart above shows the respondents’ opinions on the improvement of resource utilization through AI automation in MRI departments where 187 staff responded. The largest share 48.7% of the participants agrees with the statement that AI has enhanced resource utilization to the extent of ‘Yes but to a certain degree’, which is presented in Figure 8. After this, a significantly higher number of 31% said ‘yes, significantly.” 14.4% majority is of the view that “No, there has been no change” in the use of resources. Concerning “No, AI has increased resource wastage”, only 5.9% of the respondents share this opinion. Therefore, the data obtained portrays a relatively positive attitude towards the efficiency of the application of AI in the MRI departments with a majority of the respondents claiming that resources are used to some extent.

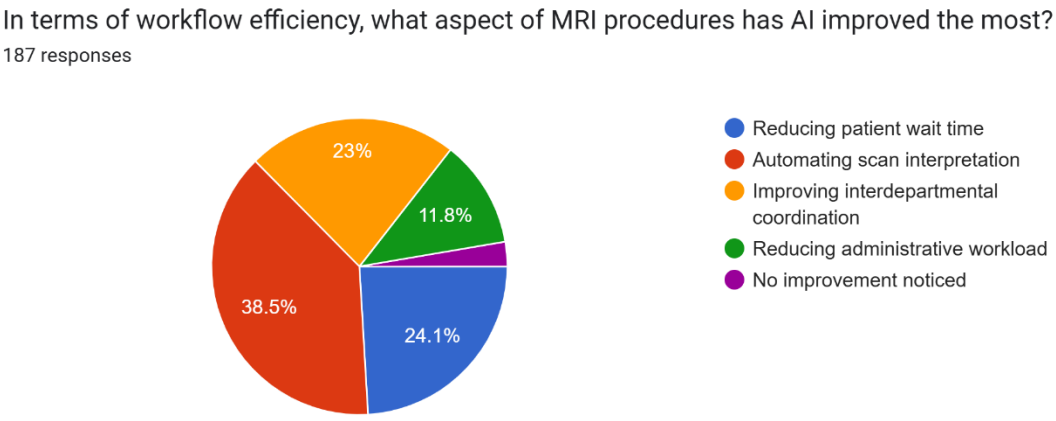

Figure 4.2.14: Response of AI influence on workflow efficiency

(Source: Collected Via Google Survey)

The last pie chart presents in 187 responses what aspect of MRI procedures AI has benefited most, regarding the amount of time spared in the next shift. From the list, the best improvement according to the responses of people is “Automating scan interpretation”. Subsequently, 24.1% of the respondents opined that AI has improved the “reducing patient wait time” factor the most. The lack of cross-functional collaboration is mentioned by 23 % of the respondents to be an issue that could be solved to work in an organization. A comparatively smaller percentage of 11.8% depicts that AI has most enhanced the aspect of “Reducing administrative workload”. Lastly, 2.7% noticed "No improvement." It was found that the best technique through which AI has boosted MRI work output is through automation of scan interpretation.

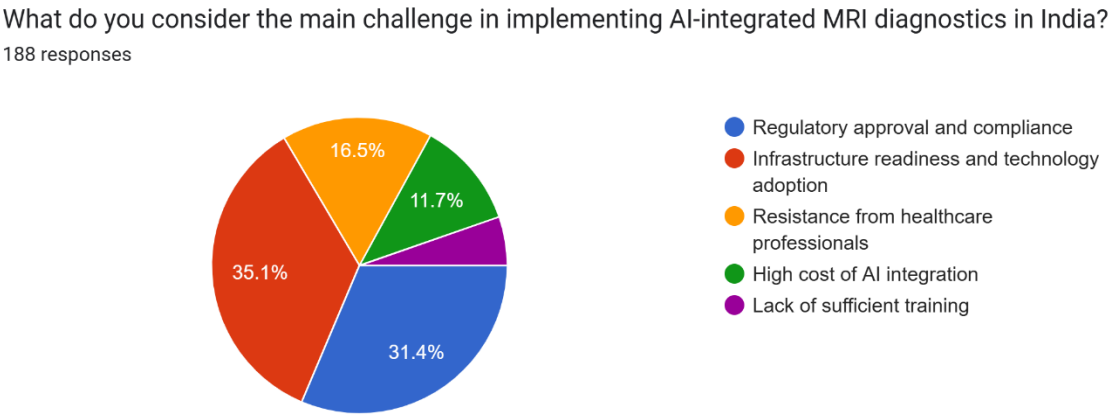

Figure 4.2.15: Responses on Main Challenges Implementing AI-integrated MRI

(Source: Collected Via Google Survey)

The pie chart above shows the responses from 188 participants and the difficulties involved in integrating AI for MRI diagnostics in India. The most cited barrier is “Infrastructure readiness and technology adoption” cited by 35.1% of the respondents. Even following closely, ‘Regulatory approval and compliance’ is identified by 31.4%. Health care professionals’ resistance is stated by 16.5 percent of the participants. 11.7% of the respondents regard the factor namely: ‘high cost of AI integration’ as the major concern. Finally, 5.3% of the respondents argue that the ‘’The major constraint is the Lack of sufficient training’’. These findings show that there are issues with technology infrastructure and regulations as the greatest barriers to the use of AI in MRI diagnosis in India.

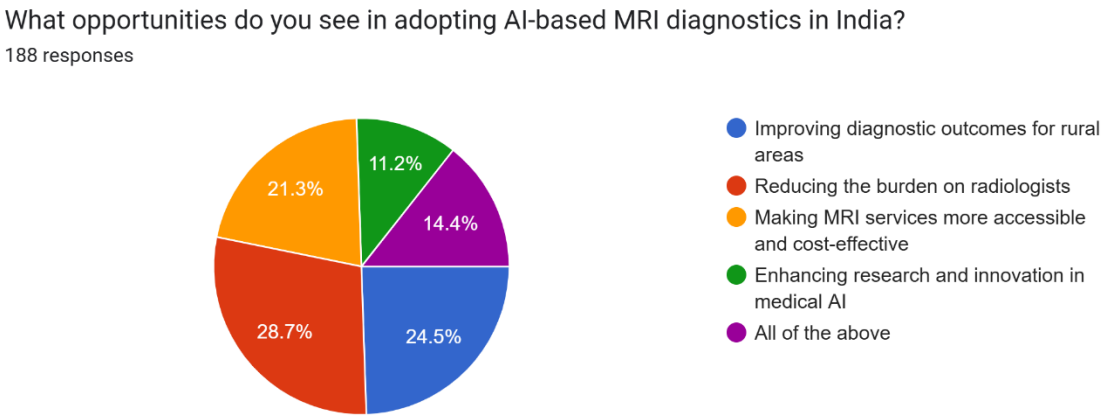

Figure 4.2.16: Visualization of consent response from the participants

(Source: Collected Via Google Survey)

The pie chart discussed above is a perception of the opportunities to adopt AI-based MRI diagnostics from a pool of 188 respondents. This is followed by the largest percentage of 28.7% for the opportunity that says, “Reduction of the burden on radiologists”. Next in line, 24.5% label “Enhancing the diagnostic outcomes of the practically deserted rural territories” as a major opportunity. The provision of MRI services which is more affordable to patients is noted by 21.3% of them. Thus, 11.2% of respondents believe that increasing research and innovation in medical AI is perceived as an opportunity. Finally, 14.4% think that “all of the above” has vast opportunities. It is seen that in India, the two major perceived benefits of using AI in MRI diagnostics are capacity relief and better rural access.

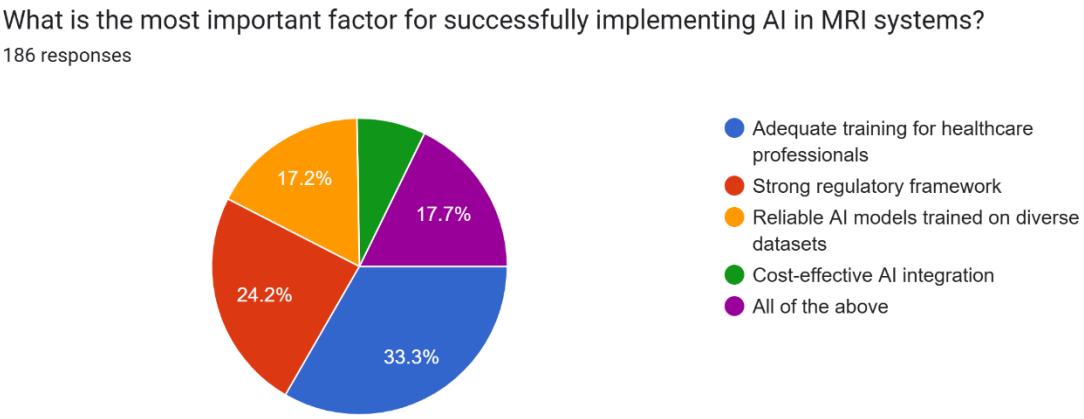

Figure 4.2.17: Visualization of consent response from the participants

(Source: Collected Via Google Survey)

The pie chart shown above highlights the respondents' view of the most significant factor for the success of AI in MRI systems based on 186 participants. The result on respondents' rating of the priority of the factors shows that adequate training for healthcare professionals garners the highest rating with 33.3%. After this, 24.2% thought that the option tagged 'A strong regulatory framework' is important. ''Models that can be trusted and built with the use of various data sets' is an attribute also mentioned by 17.2% of the individuals. About 7.6% of the participants consider that "Cost-effective AI integration" is the most important. Finally, 17.7% of the respondents thought that all of the stated factors are important "All of the above". Furthermore, it has been found that the implementation of adequate training with a well-established regulatory framework are considered to be the two most important components of AI in MRI systems.

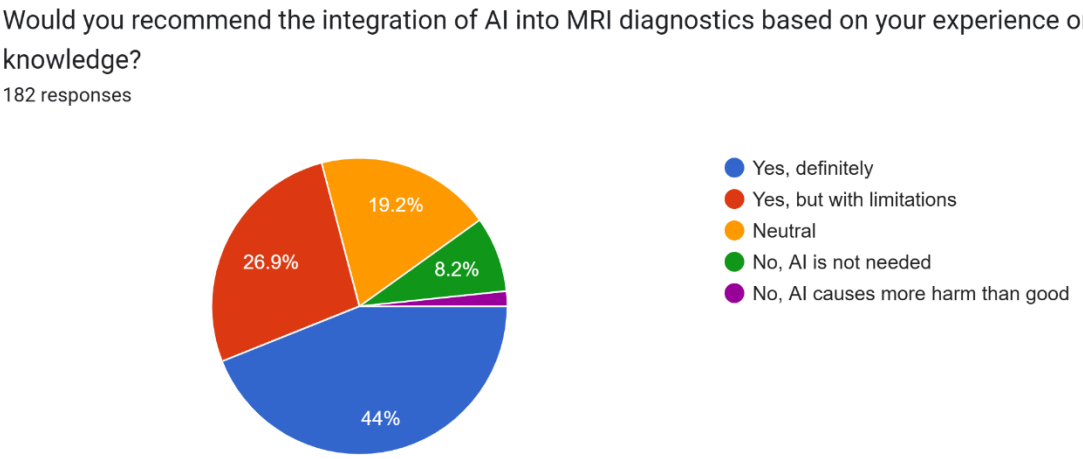

Figure 4.2.18: Visualization of consent response from the participants

(Source: Collected Via Google Survey)

This pie chart represents 182 people's opinions concerning the use of AI in the diagnosis of MRI. Out of the respondents, a large 44% said that they would "Yes, definitely" recommend it. Another 26.9% of them would recommend it in words "Yes but with conditions." Therefore, 19.2% are 'Neutral' on the matter. A minority provided negative opinions only; 8.2% of the participants responded "No, AI is not needed" and 1.6%of people answered, "No, AI has more disadvantages." Summing up, the data points to a very positive predisposition toward introducing AI in MRI diagnostics among the participants of the study, specifically, 53% of the participants stated that they have a positive attitude toward the proposed approach to using AI in MRI diagnostics and 27% of the participants had positive but somewhat hesitant attitude or reservations.

4.3 Discussion

The results of the quantitative analysis made in the previous section provide a plethora of information about professional's attitudes and AI integration concerning MRI diagnostics. The results indicate that there is a great deal of enthusiasm and a relatively good attitude toward AI adoption in diagnostic Imaging from healthcare practitioners. This discussion qualifies the critical patterns, further explains their meaning, and relates the identified patterns to the literature to facilitate a better understanding of the current state and future trends in the application of AI in the diagnosis of diseases (Zainab *et al.* 2025). Another finding is that general participation consent was very high with the majority of the respondents, 99.5% giving consent for an anonymous academic survey. This indicates that there is a high uptake among professionals in providing data to research new technologies in the medical field. It may also be associated with the practical usefulness of AI-assisted MRI in their work and the fact that they realize that it is a modern trend in diagnostic medicine.

Despite this, the survey included a representative sample of various professions that work with MRI, with a considerably larger percentage of radiologists as 35.8% of participants were from this professional field, followed by MRI technicians who was 21.9%, medical researchers 18.2%, and physicians were 15.5%. This distribution is quite interesting and meaningful as it demonstrates that the integration of AI in diagnostic radiology is a field that involves scholars from different disciplines (Faiyazuddin *et al.* 2025). Among these, the most directly affected category of users includes radiologists and MRI technicians who both operate and analyse images produced by AI. As will be seen from the survey, their large total number enhances the validity of the findings because these professionals are most suited to assess the merits and drawbacks of existing diagnostics.

Medical researchers, as well as physicians, are also included, which means that their knowledge is not limited to interpreting the images but also includes clinical and research frameworks. Whereas researchers may examine the reliability of AI models, the time needed to arrive at decisions, and compound validation of AI systems, physicians would likely be more interested in the role of diagnostics to aid them in their decision-making (Karthik *et al.* 2024). As for the other occupational categories, the groups of faculties, particularly the assistant professors, healthcare workers, and biomedical engineers point to academic and technical alliance in the academic incline, publication, and practical implementation of enhancing AI systems.

These roles are interrelated at one or the other level within the context of AI-based diagnostic algorithms from the development phase, testing phase, and implementation in the clinical environment up to the assessment of the results (Mahalingam *et al.* 2024). The variation in the experience of respondents also supports the need to argue that artificial intelligence implementation is a multidisciplinary process that requires technical, clinical, and administrative support.

While the number of professionals with any experience in AI is much higher, we wanted to focus on the results of the survey in this subgroup (Figure 4.2.2) to reflect on the consequences of using AI to enhance interprofessional relations and performance. Thus, some stakeholders may have questions about, for example, whether AI systems will help them improve their diagnosis or be used instead of it (Agrawal *et al*. 2024). It is logical to state that MRI technicians may change imaging protocols or application interface demands as a result. Such a high level of involvement of radiologists can be attributed to a combination of worry and interest regarding these advancements. This corresponds to other studies pointing out that radiology professionals view AI as being both a positive opportunity and a threatening development.

One of the questions concerning teaching is how much bias AI may contain, and how much trust can be put in such tools. To some extent, perceptions regarding algorithmic reliability, explainability, and ethical considerations could be even reflected by the professional identity, which, however, does not feature in the first two charts (Chaudhari and Telrandhe, 2024). The attention of radiologists could be on the quality of output or interpretation while the attention of researchers may be on the methodologies' solidity and replicability. This poses several questions on how such AI tools are developed, explained, and implemented within the clinical practice. Furthermore, the participation in the survey brings out the improving technology especially in the health care industry, especially in radiology. There is often the kind of resistance or even scepticism when it comes to the new technologies by some healthcare workers (Gouripur, 2024). However, the high consent rate and balanced representation of stakeholders indicate that there is a current trend for effective and involving adoption strategies, which might have been propelled by current global interest in digital health solutions, especially during the COVID-19 period.

It is therefore affirmed that AI-aided diagnosing techniques are no longer viewed as something of the future but as technologies actively being considered for now. These matters suggest that with radiology as one of the first specialties to integrate AI solutions, the results offer patterns in organizational and cultural change in healthcare facilities. However, some limitations of this discussion have to be noted (Baniya *et al.* 2024). These regards include: The survey is based on people's perception and input, which is normally influenced by the existing bias. This awareness or interest in AI may likely bring in participants with favourable perceptions towards AI hence some sort of bias may be occasioned in the survey results. Also, the gender and workplace distribution of respondents was not discussed and probably influenced the overall validity of the study. Therefore, the first results of analysing the data give a rather optimistic picture of the readiness of professionals to use AI in MRI diagnostics (Wenderott *et al.* 2024). Anecdotal evidence for the first portion of the study is affirmed by a high consent rate and the range of specialties present in the study population, demonstrating that not only healthcare professionals are aware of the role of AI but also participants suffering or experimenting with it in their work.

This study adopts a positivist worldview as radiologists and MRI technicians, who are the main stakeholders in the study, hold significant knowledge on how AI is likely to alter the diagnostic processes. This discussion thus emphasizes the need to adopt sound strategies that incorporate the best practices of every professional group to embrace by addressing the challenges they may be facing (Upreti, 2024). It is necessary to continue this research by considering different depths of the identified relationships, including trust, perceived risk, training, and AI willingness in diagnosis among institutions.

4.4 Critical Analysis and Integration with Literature and Hypotheses

Comparing and contrasting this study against the backdrop of the literature reviewed above, it is discernible that, there is convergence and divergence in the way the participants and the literature understood the role of AI-integrated MRI systems. In the current literature, the usage of AI, specifically machine learning and deep learning techniques has been showcased to improve image reconstruction, segmentation, as well as diagnosis within MRI systems. Scholars like Shen et al (2024) and Babarinde et al. They started the relevance of in-depth detection through AI models, noting that conclusions and diagnoses regarding growths like tumours and neurological disorders could be made with greater accuracy and speed compared to existing templates. The research mentioned in the literature review presents efficiency, fatigue minimization for radiologists, and automation of repetitive processes as other advantages of AI (Singh *et al*. 2024).

However, based on the results of the empirical study, it has been found that the integration of AI into MRI systems has helped in increasing the diagnostic power and work efficiency in MRI systems, but

the degree of change in such variants can be different in various settings and for different professionals (Sharma and Kaushik, 2025). Several issues raised by some of the respondents of this study relate to the 'over-reliance' on AI or the inability to explain what an AI device is doing or presenting, an aspect that resonates with recent criticism levelled against the 'black box' nature of AI systems (Küstner *et al*. 2024). It appears that what is written in literature and what actually happens in practice are not similar, and this leads to a gap. It should be noted that compared to previous work that uses controlled experiments or simulations, genuine material from practicing clinicians is used to identify operational, ethical, and confidence concerns that can constrain AI's benefits.

However, one can identify a notable lack of context within the literature in terms of the understanding of the benefits that are being offered by AI. Many of the articles presented do not address the disparity of structure, clinicians, or institutions' preparedness to integrate AI, which this study identifies as the determinative factor in AI's effectiveness in MRI systems. When asked about the projections, the participants in this study highlighted that institutional policies, data privacy policies, and lack of training hinder utilization of AI tools to their full potential in accelerating the speed of diagnoses (Rasool *et al* 2024). As noticed, this is a real-world implication, where technological possibilities often do not work practically because of certain systems that exist.

As per the hypothesis, the results are in fairly good agreement with the alternative hypothesis (H_1) that integrating AI with the MRI system increases diagnostic possibilities and work productivity. The respondents endorsed the use of AI as it has promoted the definition of images and enhancement of the effectiveness of diagnostic procedures. Numbers that illustrate the correlation between AI implementation and the enhancement of performance indicators also support this statement (Kalita et al. 2024). However, these arguments are in favour of H_1 are not absolute or without qualification. It also provides features for instance, worries over AI's effects on de-skilling or automation of human reasoning that, even if less stressed in the literature, are of substance when it comes to hypothesis production. They do not therefore negate H_1 but indicate that the benefits are not equally spread or always welcomed under any condition.

However, considering the data described above with the help of quantitative research, the null hypothesis (H_0) is in effect, negated in connection with the absence of a link between the use of AI in MRI diagnostics and improvements in precision or efficiency (Chakraborty and Banerjee, 2024). Altogether, the data represent statistically significant relationships between the use of AI and the enhancement of the primary time and accuracy of diagnosis, thus negating H_0.

These consistencies and inconsistencies between the literature and the current study suggest the need to consider the context when assessing technologies in healthcare. It is only by comparing the findings from this study with the vast literature that we can identify this study as painting a more realistic picture of the strengths, weaknesses, opportunities, and threats related to AI in MRI since they pertain to the

experience of actual workers (Kalani and Anjankar, 2024). Hence, reveals the necessity of a new approach more encompassing, which would include the technological possibility along with ethical, educational, and infrastructural readiness. However, there is still a gap that constitutes a promising area of future research in the field of implementing development interventions. prospective, multiple-site investigations of not only effectiveness and efficiency but also of AI-related organizational and psychological variables (Zubair Rahman *et al.* 2024).

Thus, although this research aligns itself with recent literature in positing the usefulness of AI in magnifying MRI diagnostics as well as throughput, it also discovers specific and tranquilized practical and systemic limitations that moderate these advantages. Therefore, when connecting the findings of the research to the theoretical concepts and hypotheses the research contributes to the theoretical discussion on AI in medical imaging by enriching it with evaluative experiences (Sinha and Kuma, 2024).

4.5 Summary

Using data from a Google Survey available online, this chapter aimed at evaluating the views and perceptions of contemporary society and people in the healthcare profession on AI-aided MRI diagnosis. According to the data, the public has a high understanding of AI and a positive perception of its potential and availability while at the same time, they are afraid of AI's reliability how their data is used, and the necessity of human supervision. Those who agree to the integration of AI also state that it should be done under the supervision of a doctor and a clear choice of human-AI teamwork. The further debate continued to cover infrastructural, and ethical concerns as well as economic issues in the context of changes in interoperability, the need for an open communication platform, and policy adjustments. The chapter maintains a moderately optimistic approach towards the incorporation of AI technology in medical imaging while at the same time observing careful measures that should be taken to ensure they are incorporated safely into patients with no compromise of their safety.

Chapter 5: Conclusion and Recommendation

5.1 Conclusion

This paper aimed at assessing the implementation of AI in MRI systems especially in the Indian context. To this end, aided by structured self-administered questionnaires conducted amongst healthcare professionals in India, the study evaluated the effects of AI technology on three key components of diagnostics, time, and output. The study presents a positive attitude towards the use of AI in diagnostics with MRI, yet there are some peculiarities that should be considered in the Indian context. From the discussion made above, it can be deduced that AI-incorporated MRI systems are friendly to the early diagnosis process, reduce the pressure of radiologists, and facilitate diagnosis. These advantages that have been outlined are very significant in India since public hospitals are usually strained with limited trained radiology experts. The integrative intelligence of automation provided by AI and its ability to support image interpretation implies the opportunity to offset the gaps in the diagnostic supply in Tier 2 and Tier 3 cities of India.

Nonetheless, this study revealed potential challenges to AI implementation in the country clearly. Among them, the most crucial one is the absence of clear and binding legal rules regarding the use of AI in medical imaging. Lack of clear guidelines from organizations including the Central Drugs Standard Control Organization (CDSCO) along with protection of data under the Digital Personal Data Protection Act (DPDPA) is not so effectively enforced and leaves a lot of space for doubts for both the hospitals and developers. Further, the Indian healthcare workforce is poorly equipped in terms of training in AI tools and many of the current MRI systems cannot replace or upgrade with newer AI software because of the outdated hardware and poor compatibility. As per the results, the alternative H_1 is valid, it can be concluded that AI integration positively affects diagnostic efficiency and practice when compared with the MRI method. At the same time, the results suggest the value of a realistic and gradual approach with ongoing community-specific policy efforts, top-quality staff training, and modernisation of infrastructure.

From the technical perspective, integrating open containers with MRI is still suboptimal in many ways. Implementation of current AI applications and technologies requires notable branches of change in the way that equipment vendors function, software compatibility, and types of hospital IT systems all come into play. It will be therefore important to run Standardization and interoperability as two important areas of development. However, ideal performances under controlled settings depict the system, though it expects operational superiority in real and diverse clinical settings. Therefore, frequently validating the algorithms and integrating and developing the algorithms over different patients are required for generalizable and precise clinical applications. The impressions that may be drawn from the study are

somewhat positive but with some reservations. AI-implemented MRI is not to replace radiologists, rather it aims to complement them. From the image interpreter, the radiologist becomes an information manager and works in synergy with AI. Consequently, future jobs will be expected to have a combination of medical knowledge and data skills.

In conclusion, the integration of advanced applications of Artificial Intelligence in MRI has the potential to revolutionise India's healthcare system. However, the attainment of these benefits entails coordination involving the health care organizations, technology firms, as well as the government. This paper discusses India's Demographic characteristics and Infrastructure differences. Overall, regulatory changes show that it requires more specific approaches that focus on interpretable Artificial Intelligence, ethical big data, and equitable access. Hence this research aims to contribute to the existing information base to understand and know from an India's market and professional perspective about what AI holds in terms of potentiality and what could be the real issues faced in the field of diagnostic imaging.

5.2 Limitation

Several limitations need to be mentioned regarding this study that can be considered as a valuable resource for understanding the integration of AI in MRI systems. These may limit the broad applicability of the results and the extent of discovery about the construct. Firstly, it solely depended on survey data and convenience sampling employed in the study had a relatively small population of respondents, which was the healthcare practitioners. Nevertheless, the responses may not include all the different categories of professionals practicing in various fields of healthcare in different settings all over the world. Even the responses are an issue subjected to prejudice since the participant's answers are influenced by their experience or knowledge regarding AI technologies.

Secondly, the generalization of the findings is tied to limitations with time and resources which extensively allowed only survey data rather than qualitative data including interviews or observation. More such methods could have provided better insights into the problems and working environment together with the actual implementation of AI in MRI environments. Also, the research mainly demonstrated the tangible and intangible advantages and disadvantages of applying AI from the human point of view, not the efficiency of AI models in terms of algorithmic performance indexes. Importantly, there was no commingling of algorithmic accuracy, inter-observer error or differences in errors by MRI machine make and model or setting.

Finally, the speed with which AI technology is developing is another limitation which might be a dynamic one. Since technology is dynamic, some of the results may be obsolete within a short period due to innovations in AI tools or due to new regulation changes. Last, the study omitted the impact of the regional level on the uptake of AI because of the economic or structural variations. It may be argued

that the specifically low-resource LMIC healthcare institutions can have some other limitations not explored in this study. However, the given study can be seen as the starting point for further research and gives practical advice on the use of AI in MRI diagnosis.

5.3 Recommendation

Considering the results presented in this research, several approaches need to be employed to unravel the optimum use of AI in MRI systems in the diverse context of India's healthcare sector. Nonetheless, the implementation of these opportunities in the Indian health sector implies overcoming infrastructural, regulatory, educational, and ethical deficiencies with the help of joint actions of all the stakeholders involved.

First and foremost, the current Indian medical imaging needs a separate sound legal framework for the use of AI. Currently, the Central Drugs Standard Control Organisation (CDSCO) does not have adequate policies for the sanctioning approval of AI-based diagnosis tools, monitoring of their utilization, and ethical usage. Policymakers require the drafting of guidelines that not only concern the testing of the AI algorithms but also how the accountability of the algorithms should be handled in case of a wrong diagnosis, how the AI algorithms should interface with the Hospital information systems and the importance of human oversight of the results provided by these algorithms. It therefore must conform with the advanced world standards and at the same time look at the realities on the round as regards to available resources of India and the existing diverse health setting of the country.

Secondly, there is a dire need to enhance data management in compliance with the Digital Personal Data Protection Act (DPDPA) before its implementation in the country. The Act does offer some form of protection, it faces limitations whenever implemented in healthcare facilities. AI audits and risk management of the implementation of AI will require hospitals and imaging centre's to nominate stringent data privacy policies and de-identify patient information used in the AI model training and certification of the actions taken by AI. There are challenges associated with the use of data and risks to patient privacy that must remain a high priority to meet the needs of clinicians and patients.

Thirdly, the Indian government as well as its healthcare facilities must invest in the enhancement of diagnostic facilities. Some health facilities, especially the ones located in semi-urban or remote areas, use MRI equipment that is not accredited for use with contemporary AI programs. These systems, to cater to the ever-growing requirements of consumers needs should be made AI-ready and integrated across the various networks with the help of subsidies, public-private partnerships, and national-level digital health initiatives like the Ayushman Bharat Digital Mission.

As education and training remained an important concern before, it also plays an important role in the present and in the future. It is necessary to educate patients, family members, radiologists, MRI technologists, and hospital administrators about the nature of artificial intelligence (AI), how to

understand its results, how to maintain the equipment, and how to ensure that it is used and maintained properly. The following requires redesign of the medical and paramedical curricula and CPD programs for medical doctors supported by medical councils and health professional associations. In this regard, AI developers need to consider the above-said factors while developing their tools. It encompasses creating models trained on the Indian demographic and clinical data, support for multiple languages in regions, and producing lightweight software to run on low-end devices. Besides that, developers have to follow the principles of explainable AI, so that the end user, namely a radiologist, can check and trust AI's work and not wholly rely on the results generated by the system. Last but not least, it is crucial to have government-academic and technology-ensemble healthcare providers and other organizations. Small-scale pilots and multi-disciplinary studies can serve to offer facts about the effects of AI on clinical and operational environments in Indian settings for policy formation and enhancement of the technology. However, the benefits of AI in MRI diagnostics are self-evident, India should embrace AI while giving it a means of a holistic and localized view. It will require policy rationalization, improvements in infrastructures, ethical standards, awareness campaigns, and universal inclusion policies for integrating AI to complement and further enhance diagnostic imaging within the various categories of healthcare in India.

5.4 Future Scope

Further studies of the possibilities of synthesizing the utilization of AI with the MRI system may bring development to the future of medical imaging as well as diagnosing. Advances made in AI algorithms suggest that their efficiency in differentiating and diagnosing as well as predicting medical conditions shall improve in the future. One of the major potentials of development is seen in the real-time diagnostic assistance in which the AI could pinpoint the particularity during the scan. Also, AI can help in achieving fully automated MRI that does not require manual modification and would enhance the process of imaging.

Another is the diagnostic systems that use patterns to establish an analysis that is as personalized as the information given regarding the patient being diagnosed. Further, the integration of AI with other imaging modalities and electronic health records should also be investigated for obtaining more global evaluation of the patients. Furthermore, the constant development of federated learning and other techniques of privacy-preserving models can mitigate ethical issues and improve data protection. In the long run with favourable policies and cooperation of both healthcare and tech industries, it opens up the possibility for the global standardization and availability of AI-assisted MRI for those with less resource access, to then progress equity in diagnostics in healthcare.

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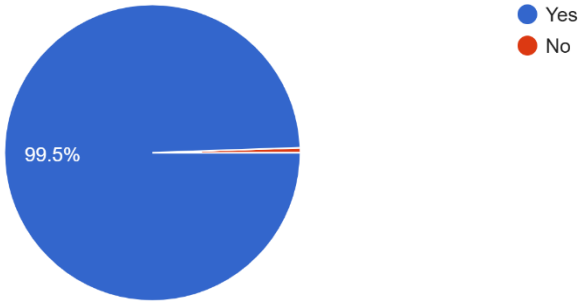
Appendices

Appendix 1: Survey answers

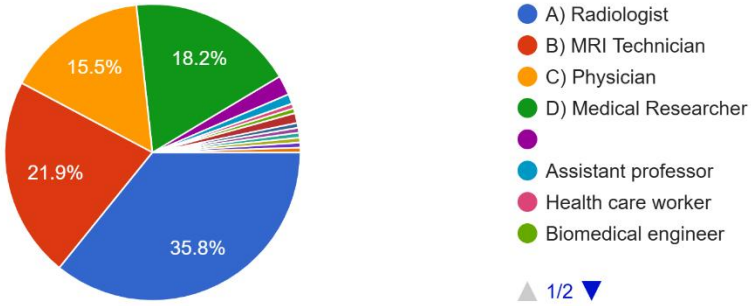
Do you consent to participate in this survey, understanding that your responses will be anonymous and used only for academic research?

188 responses



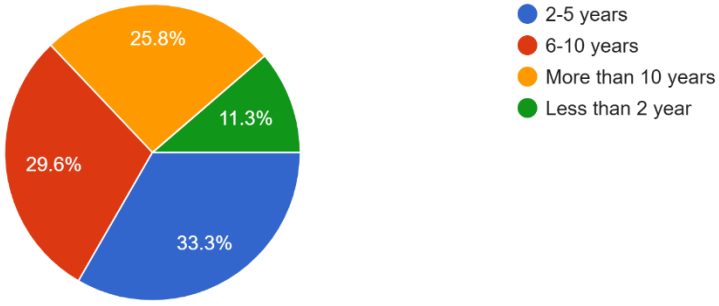
What is your professional role in the healthcare sector?

187 responses



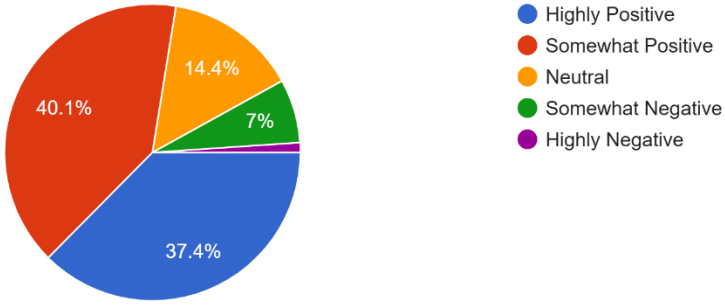
How many years of experience do you have in the medical field?

186 responses



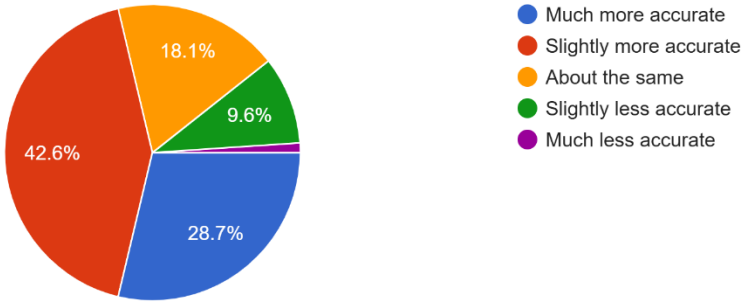
How would you rate your overall perception of AI-assisted MRI diagnostics?

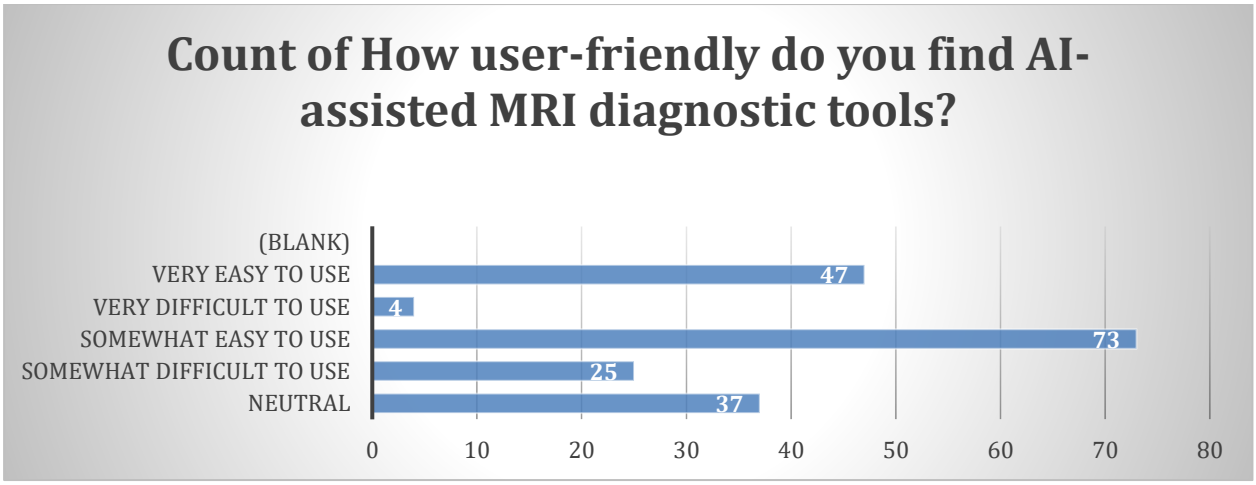
187 responses



In your opinion, how accurate are AI-assisted MRI diagnoses compared to traditional MRI diagnoses?

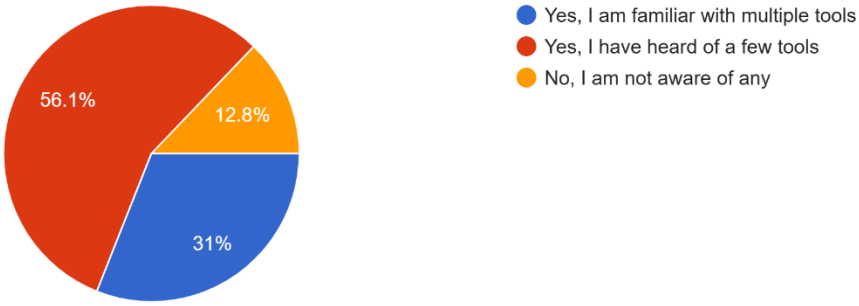
188 responses

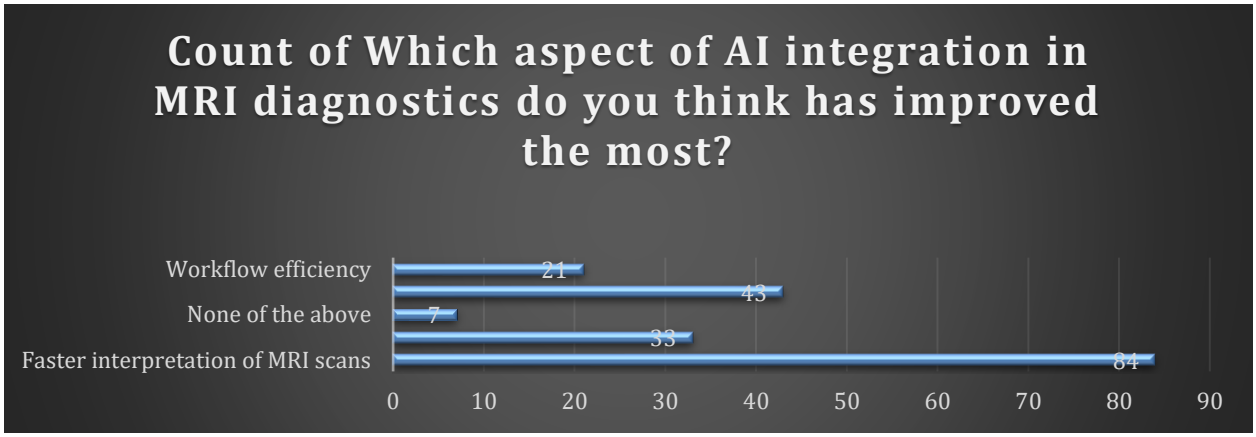




Are you aware of any AI-based MRI diagnostic tools currently being used in India?

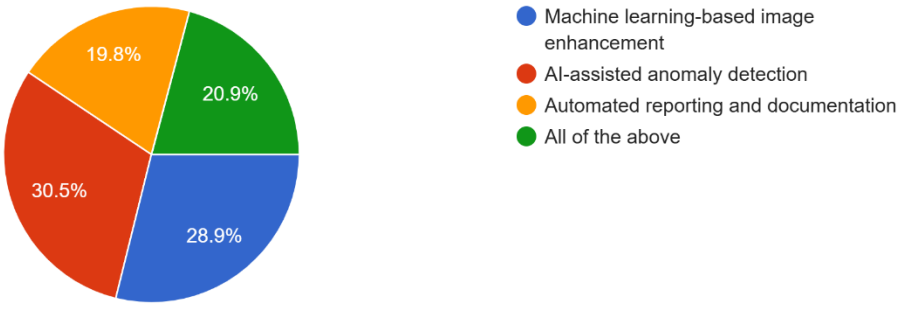
187 responses





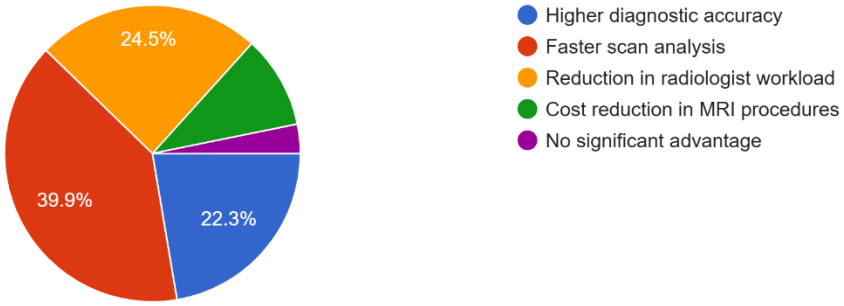
What type of AI technology do you believe is most beneficial for MRI diagnostics?

187 responses



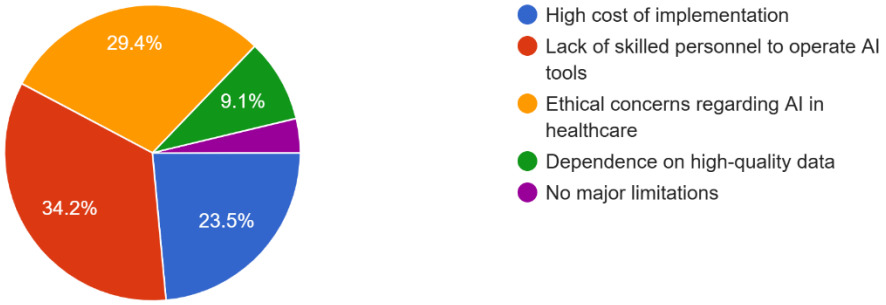
What do you consider the biggest advantage of AI-assisted MRI diagnosis?

188 responses



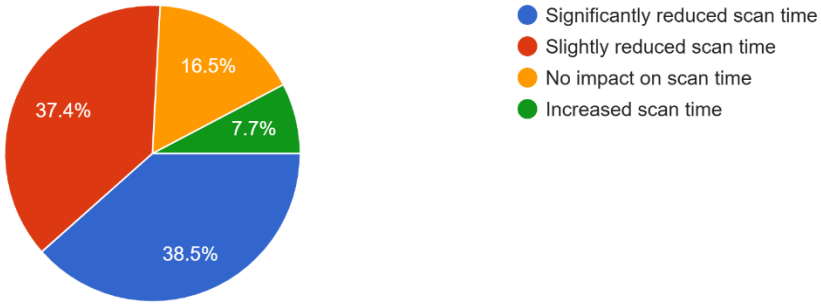
What is the biggest limitation of AI-based MRI diagnostics?

187 responses



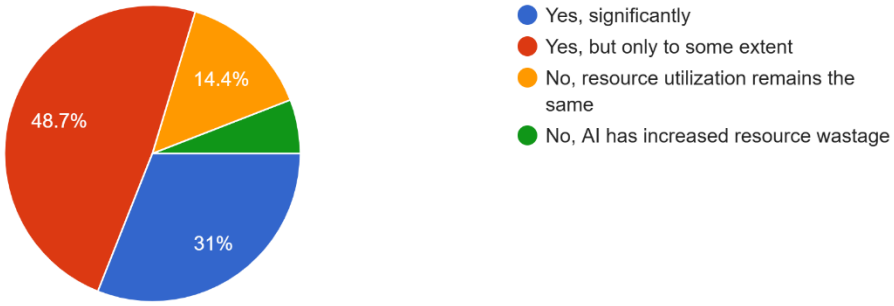
How has AI integration impacted MRI scan processing time in your experience?

182 responses



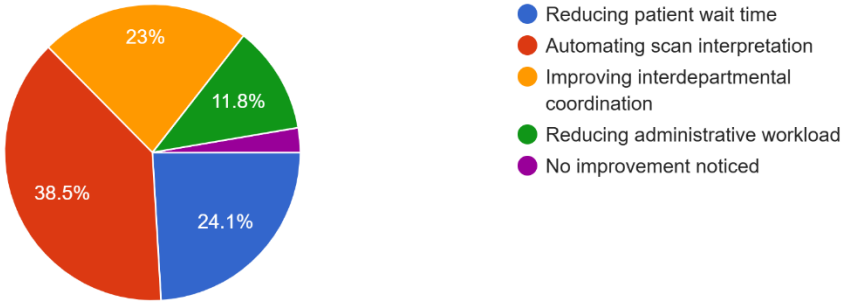
Do you think AI-driven automation has optimized resource utilization in MRI departments?

187 responses



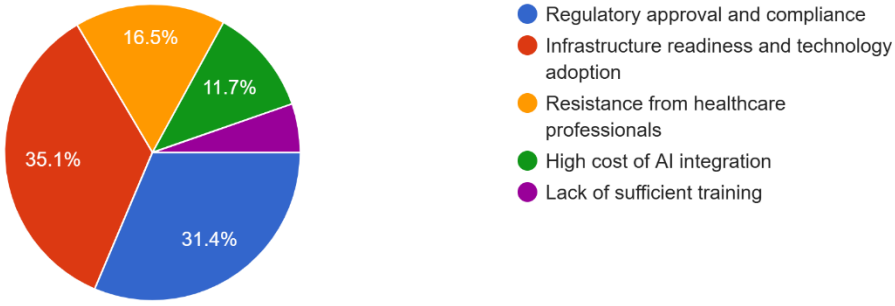
In terms of workflow efficiency, what aspect of MRI procedures has AI improved the most?

187 responses



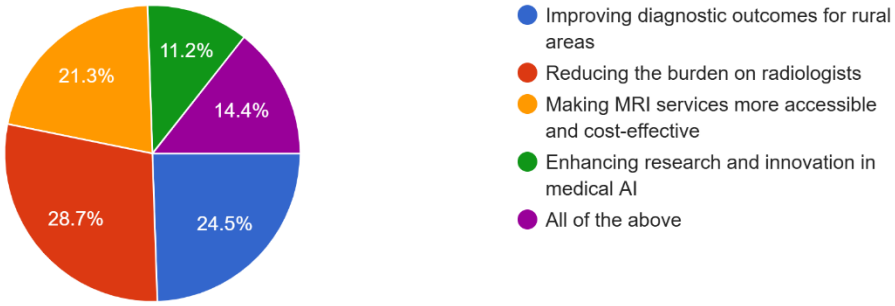
What do you consider the main challenge in implementing AI-integrated MRI diagnostics in India?

188 responses



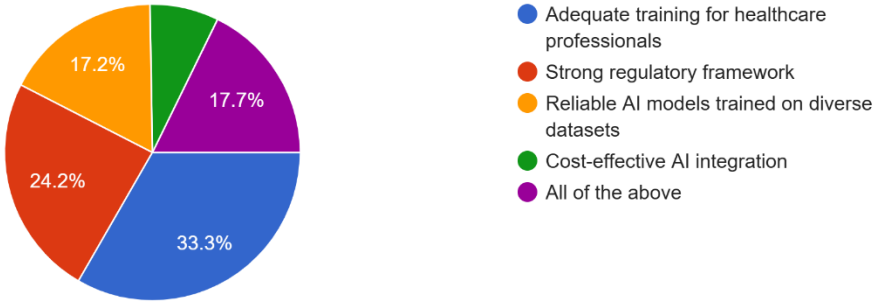
What opportunities do you see in adopting AI-based MRI diagnostics in India?

188 responses



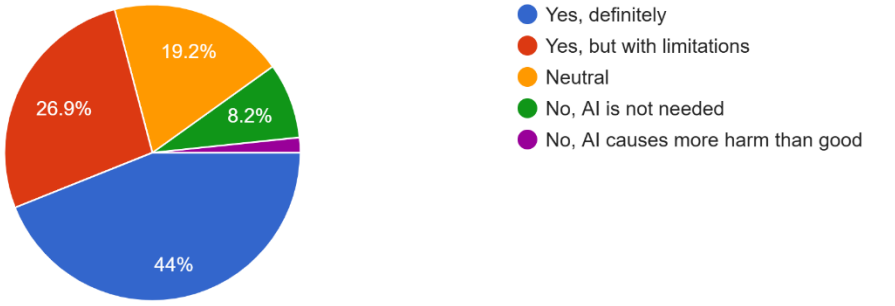
What is the most important factor for successfully implementing AI in MRI systems?

186 responses



Would you recommend the integration of AI into MRI diagnostics based on your experience or knowledge?

182 responses



Appendix 2: Ethics form

Innopharma education

GRIFFITH COLLEGE

Ethics Application & Declaration Form

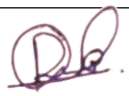
DISSERTATION TITLE: Evaluating the Integration of Artificial Intelligence in MRI Systems: Impact on Diagnostic Accuracy and Workflow Efficiency

RESEARCHER'S NAME: Ronal Sabu

PROGRAMME OF STUDY: Medical Device Technology and Business

SUPERVISOR'S NAME: Dr. Favour Okosun DECLARATION:
The information in this application form is accurate to the best of my knowledge. I undertake to abide by the principles outlined by Innopharma/Griffith College ethics policy in my research dissertation. I confirm that I have completed a full ethics assessment for my research dissertation as per the college guidelines. I will not begin my primary research until such approval from my supervisor and/or ethics Committee has been obtained.
I pledge to carry out my research according to the Innopharma/Griffith College academic integrity standards. Any results presented in my dissertation will be from my own, original research, I will reference and/or acknowledge any material or sources used in its preparation and I will not plagiarise the work of anyone else.

For Student:

STUDENT SIGNATURE: 

The research contained within this research dissertation proposal has been approved.

For Supervisor:

Ethics Committee Approval Yes ☐ No ☑

SUPERVISOR SIGNATURE: Favour Okosun

DATE: 25/03/2025

For Ethics Committee (if required): Ethics Committee Yes ☐ No ☐

ETHICS COMMITTEE MEMBER SIGNATURE:

NOTE: Supervisors are responsible for ensuring their students fill in this form correctly and that all ethical areas have been considered.

SECTION 1: DESCRIPTION OF RESEARCH STUDY

1.1 Purpose and objectives of research

Over the last few years, medical imaging has experienced big breakthroughs, especially Magnetic Resonance Imaging (MRI) has become an important tool in the diagnosis and care of different medical conditions. Earlier, MRI scans were still difficult to interpret and required a lot of effort and skill to read the MRI scan by radiologists. The introduction of Artificial Intelligence (AI) in MRI systems has been considered as a possible solution in making MRI diagnosis more precise, shortening workflow time for workflow efficiency, and maximizing the delivery of healthcare. The goal of this study is to assess how the deployment of AI in MRI systems affects diagnostic accuracy and workflow optimization in Indian health facilities.

Objectives

- To understand the reception to the idea of implementing AI in healthcare professions regarding the accuracy of MRI diagnostics, its usability, and its operation.
- To explore and review the current trend of AI tools used in MRI diagnosis to see the effectiveness in the performance of radiologists.
- To reveal the prototype of advantages and limitations that are connected with the application of AI in MRI diagnostics and potential issues concerning several aspects, namely, regulative, ethical, and practical.
- To evaluate the impact of AI-driven automation on workflow optimization in MRI procedures, focusing on scan time reduction, efficiency gains, and resource utilization in Indian healthcare facilities.
- To identify the challenges and opportunities associated with implementing AI in MRI systems across India, considering regulatory policies, infrastructure readiness, and acceptance among healthcare professionals.
- To offer evidence-based best practices to promote the effective use of AI-supported MRI diagnostic systems incorporating factors of efficiency, accuracy, and user satisfaction.

1.2 Research methodology:

In this study, survey has been used to collect research data and information. AI-driven MRI technologies have been used by radiologists who will be given surveys and then their performance will be evaluated against the precision as well as the expected diagnosis. The survey aims to find out the opinions, attitudes, and experiences with AI in prognosis by MRI radiologists. It will contain closed-ended questions such as multiple-choice questions that will help it gather qualitative insights. Radiologists will be prodded about the use of AI in decision-making, the perceived rise in diagnostic accuracy and this confidence in the accuracy of AI systems. As part of performance evaluation, Radiologists diagnose a series of MRI scans where either the use of AI techniques not is used. The results will be compared to gold standards that combine confirmed diagnosis. The survey is an appropriate method of collecting data from a large number of people, which is ideal for obtaining information regarding the experiences or perceptions of radiologists. The combination of quantitative and qualitative questions will provide both fact-based and subject-based insights on how AI influences the making of a decision by radiologists

SECTION 2: POSSIBLE ETHICAL ISSUES

Answer 'yes' or 'no' to the following questions.

SUBJECT MATTER

Does the research proposal involve:

Research into specific company activities that would be deemed sensitive or confidential	No
Research into politically and/or racially/ethnically and/or commercially sensitive areas	No
Sensitive, personal, professional or corporate issues	No

RESEARCH PROCEDURES

Does the research proposal involve:

Research that might damage the reputation of companies or participants	No
Research that may negatively affect the reputation of Griffith College/Innopharma	No
Use of personal records without consent	No
Use of company data without consent	No
The offer of any inducements to participate	No
Audio or visual recording without consent	No
Using a language other than English	No

PARTICIPANTS

Does the research proposal involve:

People who are not competent and/or fluent in English	No
Does your research group include any of the following vulnerable groups *(Adults with psychological impairments; Adults with learning difficulties; Adults under the protection/control /influence of others (e.g. in care/prison); Relatives of ill people (e.g. parents of sick children); Hospital or GP participants recruited in a medical facility; persons under the age of 18)*	No

If you have answered NO to ALL questions, please go straight to Section 4.

If you have answered YES to ANY question in SECTION 2, you must fill in SECTION 3.

SECTION 3: STEPS TAKEN TO AVOID ETHICAL ISSUES

[Only fill in this section if you answered YES to ANY of the questions in Section 3. For example, if you answered yes to including participants who are not fluent in English, you might put forward a plan that offers your survey in two languages to take this into account. Another example could be a study where the researcher wants to include information about the care received by children with a long-term condition but it would not be ethical to approach the children directly but it might be acceptable to instead ask parents questions about their child's care. If these plans are acceptable to your supervisor, you may not need to apply for ethical approval from the Ethics Committee].

3.1. If your ethics relates to ***Subject Matter***, outline your action plan to work around any sensitive issues.

3.2. If your ethics relates to ***Research Procedures***, outline your action plan to deal with possible ethical issues in your research procedures.

3.3. If your ethics relates to ***Participants***, outline how you will protect vulnerable persons or those that do not have English as their first language.

SECTION 4: ABOUT YOUR PARTICIPANTS

4.1. Outline your participant profile and why you have chosen them for this study

The participant profile consists of healthcare professionals who are directly involved in MRI diagnostics. This includes:

- Radiologists – As specialists in interpreting MRI scans, their insights are crucial in assessing how AI impacts diagnostic accuracy and efficiency.
- MRI Technologists – They operate MRI machines and work closely with AI-assisted imaging, making them key respondents in evaluating usability and workflow integration.
- Other Healthcare Practitioners – Clinicians who rely on MRI results for decision-making may provide perspectives on AI's influence on diagnostic reliability.

These participants have been selected because they have firsthand experience with AI-integrated MRI systems and can provide valuable insights into its benefits, challenges, and implications for clinical practice. Their perspectives will help evaluate AI's effectiveness in improving diagnostic precision, workflow efficiency, and overall usability in real-world settings.

4.2 How do you plan to gain access to/contact/approach your participant(s).

To gain access to participants, I will use the following approach:

- Email Invitations & Google Forms – Once potential participants are identified, I will send formal email invitations with details about the study, including a consent form and a link to the questionnaire (hosted on Google Forms).

SECTION 5: INFORMATION, CONSENT AND CONFIDENTIALITY

5.1 **Participant Information Letter (PIL) for participants**

[You must submit an information letter for participants with this application, as part of your appendices document. For online surveys, it is sufficient to include a paragraph summarising and explaining the purpose of the research at the beginning of the survey. In all other research e.g. interviews, phonecalls, a PIL should be provided to each participant before they are asked for their consent to take part. A template PIL is available in Moodle].

Please confirm below that your information letter covers:

Description of the research topic and method	Yes
Details of what participation will involve	Yes
Rights to anonymity	Yes
Confidentiality	Yes
Rights to withdraw from the research	Yes
The contact details of the researcher and supervisor (if necessary)	Yes

5.2 **Informed Consent Form (ICF) for participants**

No: my research study involves an online survey only and/or does not require signed consent

SECTION 6: STORAGE OF DATA

In accordance with GDPR and national data protection laws, all data related to the research on evaluating the integration of AI in MRI systems will be securely stored and handled throughout the study. The researcher is responsible for the storage of data, which will be stored in an encrypted, password-protected digital format. At the conclusion of the study, primary data and completed informed consent forms (ICFs) will be uploaded to the college's Moodle platform as part of the thesis submission. Data will be retained for as long as it remains useful for research purposes. If no further use is intended, the data will be retained for a shorter period, in accordance with institutional guidelines. Once the retention period ends, all data will be securely deleted.

6.1. How will you store the research data and for how long? How will you manage data protection issues?

Research data will be securely stored in an encrypted, password-protected digital format. It will be retained as long as useful for research purposes, with a shorter retention period if not. Data protection issues will be managed in compliance with GDPR and institutional guidelines.

SECTION 7: NON-DISCLOSURE AGREEMENT & STUDENT CONSENT

7.1 **Non-Disclosure Agreement (NDA)**
Will the final dissertation contain any information pertaining to any source what would warrant the use of a Non- Disclosure Agreement (NDA) e.g. industry-based research?

No

7.2 **Student consent**
If a Non-Disclosure Agreement (NDA) is not required, does the Student consent to allow their completed dissertation to be held/published by Innopharma/Griffith College?

Yes

SECTION 8: RECORDING AND RETENTION OF DISSERTATION VIVA

8.1 **Viva Recording**
The Dissertation viva will be recorded. This recording may be used to facilitate assessment by Innopharma staff, a third reader if necessary and/or if requested by the external examiner for the Programme. The recording will be held in line with current GDPR guidelines and will not be made publicly available.

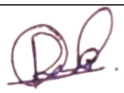
SECTION 9: DOCUMENT CHECKLIST

NOTE: Applicants must attach the following documents in electronic format to the appendix.

Which documents are added to the appendix? Please tick N/A if not applicable:

9.1 Participant Information Letter (PIL) for participant	Yes
9.2 Informed Consent Form (ICF) for participant	N/A
9.3 Questions/survey for interviewees/focus groups etc *(can be in draft form)*	Yes
9.4 Any other documents e.g. Non-Disclosure Agreement	N/A

I confirm that this application is complete and all required documents are included in the appendix.

For Student:
STUDENT SIGNATURE: 

DATE: 23/03/2025

SECTION 10: APPENDIX

Survey questions

1. **What is your professional role in the healthcare sector?**
   A) Radiologist
   B) MRI Technician
   C) Physician
   D) Medical Researcher
   E) Other (please specify)
2. **How many years of experience do you have in the medical field?**
   A) Less than 2 years
   B) 2–5 years
   C) 6–10 years
   D) More than 10 years
3. **How would you rate your overall perception of AI-assisted MRI diagnostics?**
   A) Highly Positive
   B) Somewhat Positive
   C) Neutral
   D) Somewhat Negative
   E) Highly Negative
4. **In your opinion, how accurate are AI-assisted MRI diagnoses compared to traditional MRI diagnoses?**
   A) Much more accurate
   B) Slightly more accurate
   C) About the same
   D) Slightly less accurate
   E) Much less accurate
5. **How user-friendly do you find AI-assisted MRI diagnostic tools?**
   A) Very easy to use
   B) Somewhat easy to use
   C) Neutral
   D) Somewhat difficult to use
   E) Very difficult to use
6. **Are you aware of any AI-based MRI diagnostic tools currently being used in India?**
   A) Yes, I am familiar with multiple tools
   B) Yes, I have heard of a few tools

C) No, I am not aware of any

7. **Which aspect of AI integration in MRI diagnostics do you think has improved the most?**
   A) Image reconstruction quality
   B) Faster interpretation of MRI scans
   C) Reduced human error
   D) Workflow efficiency
   E) None of the above
8. **What type of AI technology do you believe is most beneficial for MRI diagnostics?**
   A) Machine learning-based image enhancement
   B) AI-assisted anomaly detection
   C) Automated reporting and documentation
   D) All of the above
9. **What do you consider the biggest advantage of AI-assisted MRI diagnosis?**
   A) Higher diagnostic accuracy
   B) Faster scan analysis
   C) Reduction in radiologist workload
   D) Cost reduction in MRI procedures
   E) No significant advantage
10. **What is the biggest limitation of AI-based MRI diagnostics?**
    A) High cost of implementation
    B) Lack of skilled personnel to operate AI tools
    C) Ethical concerns regarding AI in healthcare
    D) Dependence on high-quality data
    E) No major limitations
11. **How has AI integration impacted MRI scan processing time in your experience?**
    A) Significantly reduced scan time
    B) Slightly reduced scan time
    C) No impact on scan time
    D) Increased scan time
12. **Do you think AI-driven automation has optimized resource utilization in MRI departments?**
    A) Yes, significantly
    B) Yes, but only to some extent
    C) No, resource utilization remains the same
    D) No, AI has increased resource wastage
13. **In terms of workflow efficiency, what aspect of MRI procedures has AI improved the most?**
    A) Reducing patient wait time
    B) Automating scan interpretation
    C) Improving interdepartmental coordination
    D) Reducing administrative workload
    E) No improvement noticed
14. **What do you consider the main challenge in implementing AI-integrated MRI diagnostics in India?**
    A) Regulatory approval and compliance
    B) Infrastructure readiness and technology adoption
    C) Resistance from healthcare professionals

D) High cost of AI integration
E) Lack of sufficient training

15. What opportunities do you see in adopting AI-based MRI diagnostics in India?

A) Improving diagnostic outcomes for rural areas
B) Reducing the burden on radiologists
C) Making MRI services more accessible and cost-effective
D) Enhancing research and innovation in medical AI
E) All of the above

16. What is the most important factor for successfully implementing AI in MRI systems?

A) Adequate training for healthcare professionals
B) Strong regulatory framework
C) Reliable AI models trained on diverse datasets
D) Cost-effective AI integration
E) All of the above

17. Would you recommend the integration of AI into MRI diagnostics based on your experience or knowledge?

A) Yes, definitely
B) Yes, but with limitations
C) Neutral
D) No, AI is not needed
E) No, AI causes more harm than good