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An Empirical Investigation in Measuring the Role of Machine Learning (ML) in Enhancing Innovation in the Health Care Industry for Sustainable Business Perspective

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ABSTRACT
Over the years, machine learning emerged as one of the key technologies to enhance the healthcare industry by incorporating different practises and enhancing the overall treatment facilities. This appears to be a significant help for both patients and medical professionals in terms of predicting potential illness that people suffer from. Using this particular technology, the healthcare industry essentially improves patient service by predicting medical outcomes and taking effective measures against it. Security and privacy concerns appear to be significant challenges that healthcare faces while implementing machine learning. However, the advantage level of the concerned technology appears to be quite high within healthcare that essentially enhances medical treatment of the patients as well. The concerned research incorporated principles of "positivism research philosophy", the "deductive research approach" and "descriptive research" design to meet desired research outcomes. On the other hand, primary data collection and quantitative data analysis methods are also implemented in this study to identify and understand the role of machine learning in enhancing innovation in the healthcare industry for a sustainable business perspective. Primary data collection in the form of a survey has been conducted in this research where 50 participants were considered as the sample size which essentially helped reach eventual outcomes.
Keywords: Machine learning, healthcare, medical facility, patient care, decision-making

INTRODUCTION
Machine Learning has become a massive trend in the industry because it is a sophisticated as well as technologically advanced implementation of innovation. Machine Learning is everywhere, and it is employed in a multitude of scenarios. It is crucial in a variety of sectors, including banking, health sciences, and cybersecurity [1]. Along with to their competitive advantage for a wide range of different types of healthcare applications ranging from the predictive model of cardiogenic shock from one-dimensional cardiovascular signals to computer-aided treatment plan (CADx) utilizing multi-dimensional clinical data, deep learning (DL)/ Machine learning (ML) strategies have seen broad acceptance in past few years [2]. Despite the impressive performance of ML/ DL, there are still concerns about its reliability in care environments (which is usually considered difficult because of several security and privacy concerns directly implicated), particularly in context of current findings that ML/DL is susceptible to adverse threats.
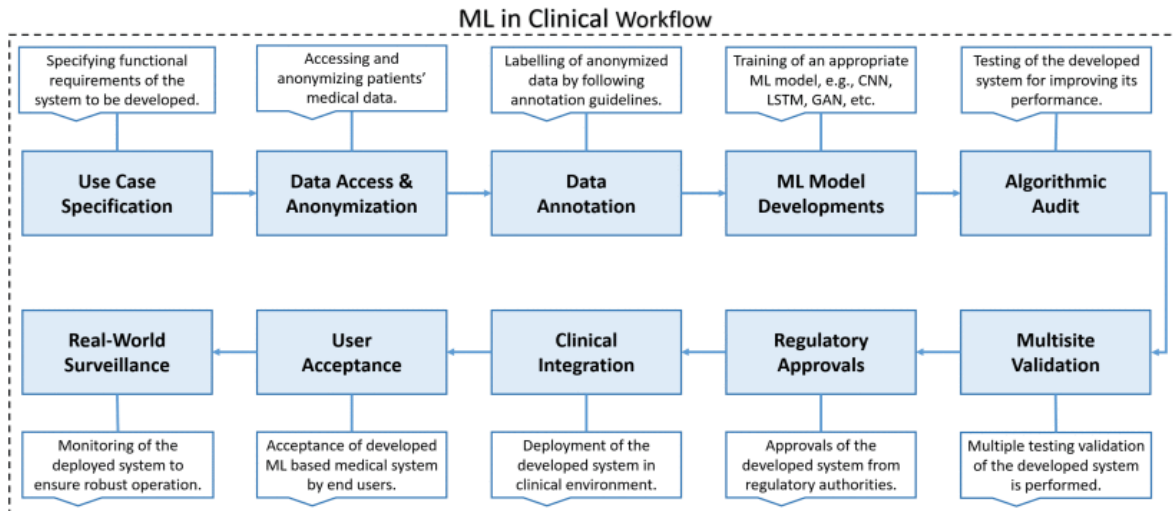
Figure 1: Machine Learning in clinical workflow [2]

It has already been reported that the use of "big data platforms"along with techniques is consistently assisting in regulating the actual information development in the healthcare system. Firstly, an empirical study of the role of Machine Learning in the health sector is carried out. Data science has been proven to be significantly utilised in the healthcare business. It is tough to say how big data as well as deep learning will impact the healthcare business right now. The number of experts that employed machine learning and big data analytics in sickness diagnosis did not place a strong premium on integrity and confidentiality, according to studies [3]. In today's world, "coronary heart disease" is one of the leading causes of mortality. Identifying cardiovascular disease is a significant challenge in biomedical research methods. Machine learning (ML) has shown to be quite helpful in assisting with decision-making along with forecasting of massive volumes of data generated by the healthcare industry. Recent achievements in numerous areas of the Internet of Things have also used machine learning techniques (IoT) [4]. The use of machine learning to detect heart problems has only begun to explore studies. Researchers present a novel method for detecting essential traits using machine learning methodologies in this work, which improves the accuracy of cardiovascular disease identification.
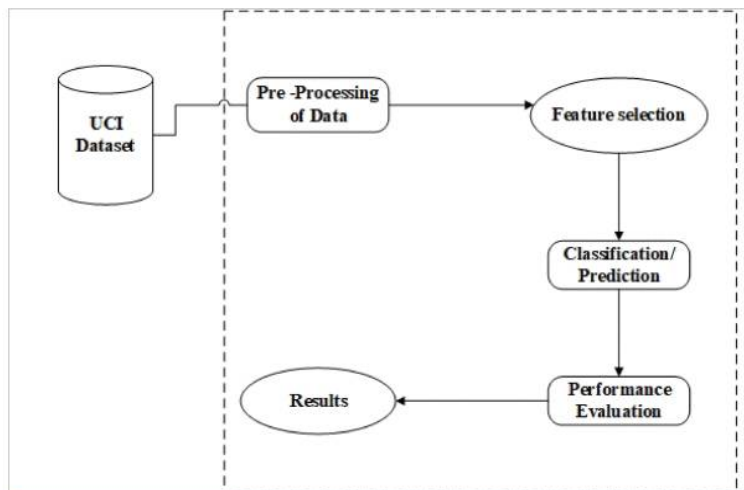

Figure 2: Experiment workflow with UCI dataset [4]

Researchers examine those different types of machine learning applicationsare really helpful for generating effective decision assistance for healthcare systems in this research [5]. This work contributes to closing the research gap in the development of effective management information systems for clinical applications.

LITERATURE REVIEW

Machine learning is a multidisciplinary field having foundations in statistical data, mathematics, information processing, and intelligence insights, among other things, making it difficult to come up with a new description. ML is an AI-powered technology that gathers knowledge from test examples. Supervised Machine Learning is pushed through its paces, and the algorithm creates a simulation that connects sources to relevant outcomes [6]. The classification problem is a common occurrence in supervised machine learning projects. Semi-supervised learning is a method for identifying the best classifier utilising both unlabelled and labelled data to find the best model. It achieves excellent classification results by using unsupervised learning. This strategy's efficacy is solely based on a few crucial parameters.
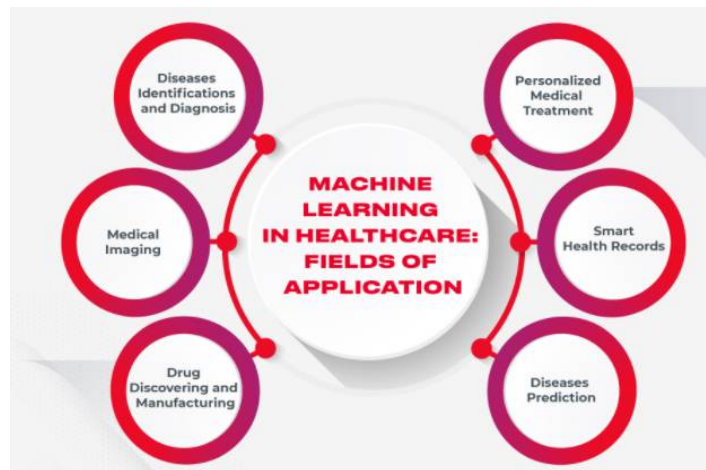

Figure 3: Machine learning in Healthcare [6]

An effective Machine Learning-based medical system takes advantage of the computer's massive computational power as well as the doctor's reasoning abilities. Both the equipment and the practitioner are analysing data, but the practitioner is unable to assess each patient's pulse or be knowledgeable of all the complexities of each condition. All of these duties will be performed by the machine, which will then give the results to the doctor for approval. The clinic's financial department can use the Decision Support System to keep track of charges, receivables, outlays, and payables [7]. This strategy also assists in the maintenance of the patient's insurance coverage as well as other return options. It's a company that provides a variety of DSS in health care system applications. Researchers have recently changed their attention to using digital image processing techniques to retrieve, evaluate, and classify brain malignancies from MRI scans (MRI). The first publication, titled "Computer-Assisted Tumour Type Determination Using Magnetic Resonance Imaging Characteristics," gives a thorough overview of recent MRI-based brain tumour multiclass classification investigations [8].

To emphasise the strengths and drawbacks of particular works, a collection of standard measures from the assessed works is retrieved and analyzed. The current review study offers a series of guidelines for brain tumour categorization researchers and experts.Machine learning algorithms are effective for discovering complex patterns in massive quantities of data. This infrastructure is ideal for biomedical studies, specifically for those who relied on sophisticated genomes and biochemical measures. It is frequently employed in the diagnosis and monitoring of a variety of illnesses. Machine learning algorithms in clinical applications will make better judgements about treatment plans for patients by suggesting how to create a beneficial health sector [9]. This strategy is being used by the healthcare system to estimate long waiting times for patients in the emergency department. These algorithms calculate wait times based on patient information, pain levels, emergency care records, as well as the architecture of the hospital ward. Clinics will consider hospital room admissions by using predictive approach. As a result, a machine learning program might benefit patients by lowering costs, increasing accuracy, or disseminating a limited experience. Machine learning approaches have shown potential for improving clinical outcomes, lowering healthcare expenditures, and advancing medical studies.

Numerous hospitals, on the other hand, are not actively using machine learning technologies. One factor seems to be that many health-care practitioners lack the machine-learning knowledge required to create a successful strategy, implement it in reality, and incorporate it into the healthcare setting [10]. Automated machine learning (AutoML) is a broad industry that aims to select appropriate, compose, as well as parameterize machine learning algorithm in order to obtain optimal effectiveness on an assigned activity and/or raw data, in addition to making machine learning algorithms simpler and more efficient and start reducing the requirements of human professionals. While ML applications have several proven

benefits, its effective use necessitates a significant amount of work on the part of human specialists, since no technology can deliver the best results on all feasible challenges. Despite their familiarity with clinical evidence, medical researchers usually lack the ML performance required to apply these approaches to large data sets.

Figure 4: Role of Machine Learning in healthcare[11]

Healthcare experts can and do collaborate with professional data analysts, but the interaction takes time and effort from both sides. Not just that, but information and human skills are in short supply in most places, particularly in healthcare. As a result, developing and deploying machine learning solutions is complex, as the process has started with a significant data supply procedure, continues with identifying the suitable partners, and requires constant "back-and-forth" between ML professionals and subject matter experts [11]. A data scientist is frequently entrusted with producing explanatory variables, also referred as characteristics, that are representative of the preferred outcome when faced with a supervised learning challenge. Effective classification algorithms necessitate the construction of qualities that not only give meaningful information from the data, but also compensate for any limits imposed by the deep learning model[12]. Because the generation of these characteristics frequently necessitates substantial subject expertise, it is normally done manually by a "human expert" through trial and error. As a result, feature extraction is a time-consuming yet important phase in the machine learning process.

Figure 5: Machine learning algorithm in healthcare [13]

Big data allows a company to collect and handle massive amounts of data at rapid speeds in order to get the most useful information from it. To turn raw data into information and improve the decision-making process, several tools and approaches are necessary to investigate diverse and massive data. Big data analytics (BDA) refers to the techniques and strategies for transforming large amounts of data into information that can be used for analysis. BDA is a technology company that combines IT, business professionals, and data scientists [13]. It is concerned with gaining greater insight into a company organisation so that it may be guided in the appropriate path.

MATERIAL AND METHODS
The concerned research considered positivism research philosophy to conduct a logical analysis and enhance potential research outcomes. One of the main benefits of positivism research philosophy is its

ability to evaluate quantifiable data through which efficient results can be generated [14]. In addition, integrating this particular philosophy the concerned research further identifies data patterns and maintains reliability effectively. Positivism philosophy helps research integrate an objective-driven approach which further helped this study to generate specific results. On the other hand, the deductive approach has been incorporated in this research to conduct a scientific analysis and reach potential research outcomes. One of the major advantages of using the deductive approach is its capability to generalise data which has helped this study understand and identify potential data patterns and trends [15]. Descriptive research design has been implemented in this study to provide a systematic description of the phenomena and explain the research context. Integrating descriptive design, the concerned research conducted an in-depth analysis which further facilitated the probable research outcome in this regard. Primary data collection has been used in this research to present first-hand data regarding the utilisation of machine learning and enhance business sustainability. On the other hand, primary data essentially helps maintain reliability and validity by incorporating authentic information from the data source. The quantitative data analysis technique has been used in this study to quick data collection and analysis [16]. Moreover, using this particular data analysis approach, the concerned study essentially marinated objectivity which also helped achieving precise data result in this regard. Primary data collection in the form of a survey has been conducted in this research where 50 industrial experts have been considered as the sample size.

Research questions

What are sustainable business perspectives in healthcare?

What is the role of machine learning in enhancing innovation in the healthcare industry?

RESULTS
Primary data analysis

The concerned research has used a close-ended survey approach to collect first-hand data. A total of 50 participants have been considered as the sample size of this research.

Survey questions:

Q1. Do you believe machine learning enhances the decision-support system in the healthcare industry?

TABLE 1: MACHINE LEARNING ENHANCES DECISION-SUPPORT SYSTEM

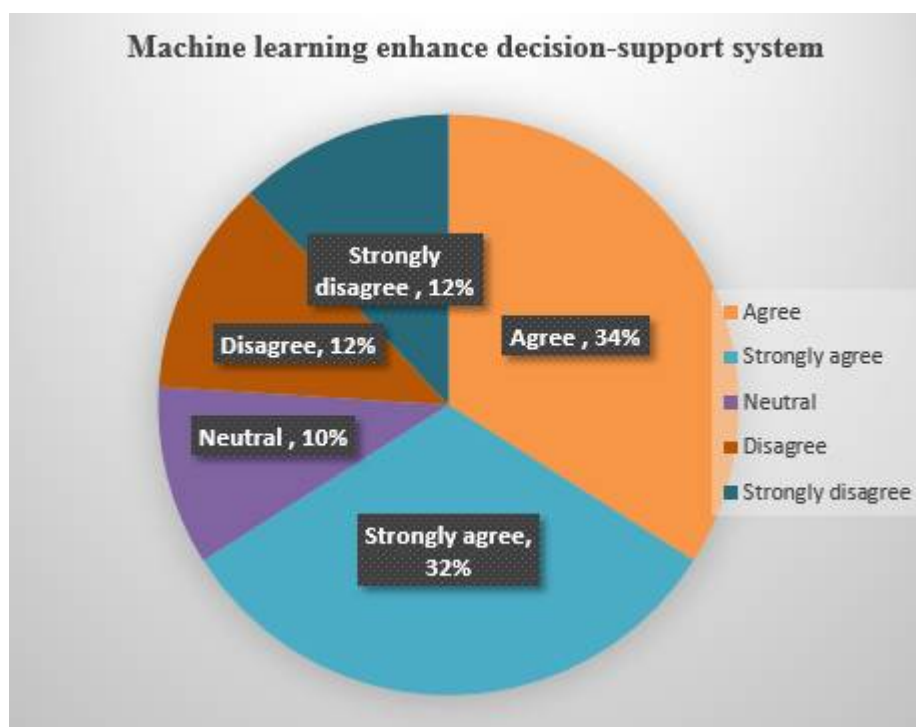| Option	No of respondent	Percentage
Agree	17	34
Strongly agree	16	32
Neutral	5	10
Disagree	6	12
Strongly disagree	6	12
Total	50	100

Figure 6: Machine learning enhances decision-making support system

Regarding this question, 32% and 34% of the participants have respectively strongly agreed and agreed that machine learning essentially enhances the decision-making support system in the healthcare industry. This highlights the significance of using machine learning in the concerned sector in terms of making improved decisions and facilitating the medical system. On the other hand, 10% of the respondents have showcased their neutral stand in this question while 12% of the participants have disagreed with the same. Lastly, 12% of the respondents have strongly disagreed that machine learning enhances decision-making support systems in the healthcare industry.

Q2. How far do you agree that machine learning algorithms are effective in terms of discovering complex patterns in healthcare?

TABLE 2: MACHINE LEARNING HELPS DISCOVER COMPLEX MEDICAL PATTERN

Options	No of respondent	Percentage
Agree	14	28
Strongly agree	16	32
Neutral	8	16
Disagree	4	8
Strongly disagree	8	16
Total	50	100

Machine learning helps discover complex medical patterns
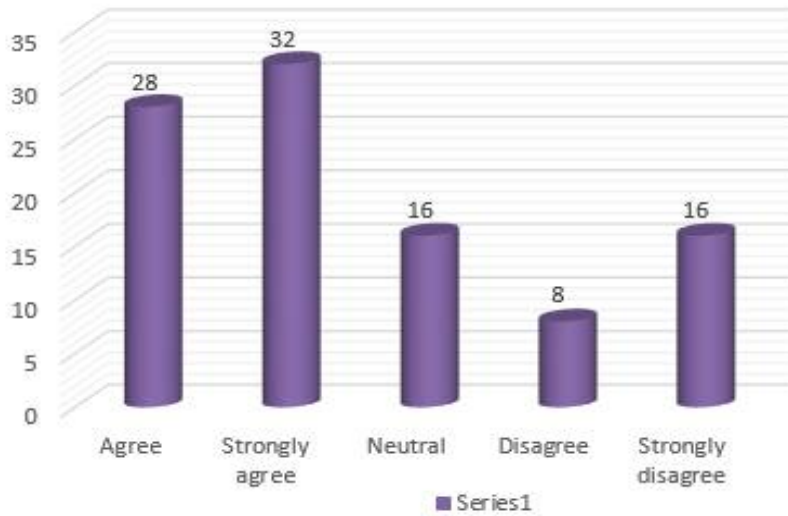
Figure 7: Machine learning helps discover complex medical patterns

Concerning this question, 28% and 32% of the participants have agreed and strongly agreed that machine learning helps discover complex medical patterns in the healthcare industry. In addition, 16% of the respondents remained neutral regarding this question. 8% and 16% participants respectively disagreed and strongly disagreed on this question. This essentially highlights that the utilisation of machine learning in the healthcare system does not come beyond question.

Q3. Do you agree that automated machine learning helps setting medical parameters in the healthcare industry?

TABLE 3: AUTOMATED MACHINE LEARNING HELPS SET MEDICAL PARAMETERS

Options	No of respondent	Percentage
Agree	11	22
Strongly agree	14	28
Neutral	8	16
Disagree	10	20
Strongly disagree	7	14
Total	50	100

Automated machine learning helps set medical parameter
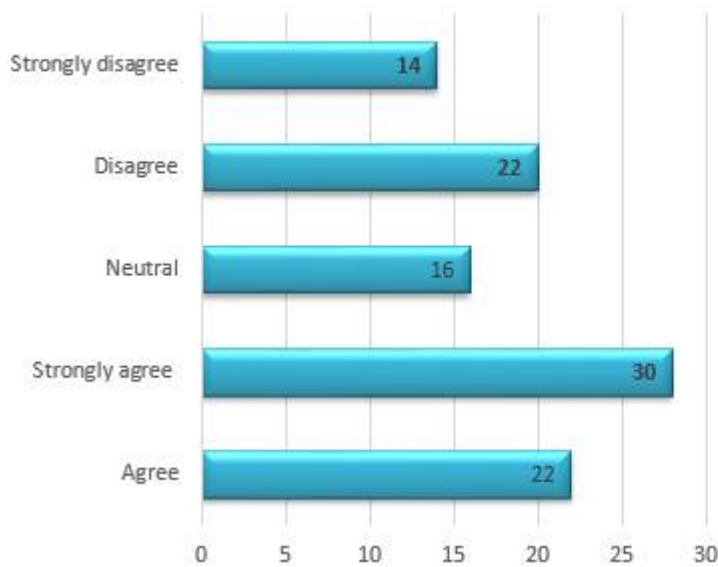
Figure 8: Automated machine learning helps set medical parameter

Concerning this particular question, 22% and 30% of the respondents agreed and strongly agreed that automated machine learning helps set medical parameters in the healthcare industry. This also showcases the various usage of the concerned technology within the healthcare sector and providing quality health service to patients. In addition, effective integration machine learning also helped in fastening the overall process and thus facilitating the overall medical system within the concerned sector. 16% of the respondents remained neutral regarding this question while 22% have showcased their disagreement on the same. Lastly, 14% of the participants have displayed their strong disagreement on whether automated machine learning helps set different medical parameters to facilitate overall healthcare.

DISCUSSION

Machine learning refers to the fundamental study of computer algorithms that certainly improve user experience and for the purpose it is being used by integrating automation. Over the years, machine learning appears to be one of the most effective and demanded technologies within the healthcare industry in terms of enhancing medical facilities and providing appropriate customer satisfaction [17]. Machine learning algorithms are used for conducting a comprehensive analysis based on the data sample which is also known as training data. This particular process is used to make effective predictions and that further enhances the decision-making process. The concerned process does not need an effective programme to be dependent on and it essentially functions without having no certain programme-based functionality. Using this particular process in the healthcare industry, it has been observed that necessary medical data from patients is collected which further helps incorporate effective data trends and make necessary predictions regarding medical outcomes of the patients [18]. On the other hand, effective integration of machine learning also helps incorporate a systematic process in the medical system which plays a significant role in conducting medical assessment for the patients and further facilitates the overall healthcare system. Upon considering the major data trends from primary data collection, it appears that machine learning plays a fundamental role in improving decision-support systems within healthcare. It is considered as one of the major advantages of the concerned system that has an effective benefit in terms of successfully identifying potential data trends within the concerned industry.

Moreover, effective integration of machine learning also enhances the overall data analysis facility which appears to be a crucial addition for healthcare in terms of predicting probable medical outcomes. Machine learning within healthcare technologies work on the basis of algorithms with "self-learning neural networks" that further facilitate the quality treatment of the patients [19]. Upon considering this particular aspect, the importance of machine learning can be understood in this regard and also the effective facilities it provides to enhance patient progress. This is also one of the major reasons behind increased demand for machine learning within the healthcare industry. Considering this particular aspect, effective incorporation of machine learning can essentially enhance medical treatment by integrating

necessary medical principles regarding patient care. Machine learning directly assess patient data and based on that make essential medial prediction that proves helpful for the overall healthcare and also meet patient requirements. Along with improving medical quality, machine learning also facilitates the basic process of data analysis which include X-Rays, CT Scans, screenings and different tests [20]. Based on these data the concerned technology further improves the data prediction process which plays a key role in enhancing the eventual medical care in this regard.

Upon considering this factor, machine learning has become one of the major technologies that significantly enhance the capability of healthcare. Moreover, this particular technology also makes all medical processes faster which certainly helps hospitals and medical care institutions to improve the overall medical system and also plays an integral role in developing a strong connection within the concerned industry. Appropriate integration of machine learning in healthcare predicts illness and facilitates physicians to treat the patient properly [21]. Based on the primary data collection it also appears that machine learning helps physicians identify complex patterns of the illness and also conduct a root cause analysis to understand the kind of illness one is suffering from. This particular aspect emerged as one of the critical processes for healthcare in terms of predicting the illness and taking effective measures against it. Considering this aspect, the appropriate role of machine learning in enhancing the healthcare industry can be understood. Upon considering the primary data collection, automated machine learning appears to be another significant form of machine learning that makes direct contributions to healthcare improvement [22]. This particular technology plays a pivotal role in setting the realistic and effective benchmark for healthcare to achieve. Therefore, achieving that sort of benchmark automatically meets major medical criteria. It is further to be seen that effective integration of the concerned technology essentially boosts medical performance by understanding patient needs and providing them with those solutions on time.

CONCLUSION

Concluding this it can be said that the integration of machine learning has certainly been helpful for healthcare in terms of predicting medical outcomes and allowing medical professionals to be ready for that. The concerned research integrated positivism research philosophy, the deductive research approach and descriptive research design to essentially ensure reaching appropriate research outcomes. On the other hand, primary data collection and quantitative data analysis techniques have been used in this research to reach expected research results. Upon considering the data results gathered from the primary data analysis, automated machine learning emerged as one of the effective technological interventions that directly facilitate the medical treatment by setting necessary parameters to achieve.

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