

Analyzing the Effectiveness of ML Agents in Enhancing the Predictive Model in Decision Making for Medical Practitioners in the Healthcare Industry: A Structural Equation Model Analysis

Anand Prakash Dube^{1*}

Research Scholar, Department of Computer Science & Technology,
SHUATS, Prayagraj
ananddubesms@gmail.com

Raghav Yadav²

Associate Professor, Department of Computer Science & Technology,
SHUATS, Prayagraj
raghav.yadav@shiats.edu.in

Abstract- In order to enhance the effectiveness of the clinical predictive model, ML agents are at once essential in healthcare sectors. However, the research is going to investigate the contribution of autonomous ML agents while predicting any disease outcomes and conducting necessary decision-making approaches. Autonomous agents can efficiently mitigate human efforts towards any critical disease detection processing any important treatment procedures. In order to increase overall efficiency in the healthcare sectors, applications of these autonomous factors are essential. Researchers have conducted various surveys in order to investigate the contributions of ML agents in managing various AI-oriented surgeries in the healthcare industry. Therefore, ML agents are necessary for the healthcare sector for early risk determination.

The research study tends to apply a quantitative survey method that has been granted for the researchers related to the topic. However, among 80 participants, healthcare researchers have conducted effective survey analysis. In order to understand the significance of utilizing ML agents, innovative decisions regarding clinical technologies can be beneficial for amplifying the efficiency of the predictive model. Moreover, a detailed analysis on the discussion of benefits regarding machine learning determinants in healthcare has been conducted successfully after analyzing all efficient survey outcomes over the specific research topic.

Keywords- ML agents, autonomous determinants, decision-making approaches, physicians, efficiency enhancement, patients' care, predictive model, participants, healthcare sectors, and survey analysis

I. INTRODUCTION

Today, the demand for various ML agents and their applications for amplifying the predictive model has increased than before. These autonomous agents are necessary for the UK-based healthcare sectors for undertaking any important decisions. As per Jain, medical practitioners for that reason tend to implement the effectiveness of important ML agents in various practices of the healthcare industry [1]. However, it has been evaluated that with the analysis of a structural equation model, researchers can successfully investigate the contributions of these autonomous agents for any decision-making approach in medical sectors. Moreover, the analysis also discusses the importance of applying necessary ML agents into healthcare sectors towards sustainable development in the future.

According to Jain and Pandey, ML agents are at once necessary for the healthcare industry in order to demonstrate as well as provide patients with relevant medical information on various diseases [2]. On the other hand, important outcomes, as well as pathways related to numerous treatment options, also can be determined by the use of these autonomous agents. Physicians tend to focus more on the effectiveness of using ML agents in increasing the predictive model for any clinical predictions in the sustainable future. Numerous healthcare sectors in the UK use autonomous agents that can regulate hospitals as well as the health service system from a positive perspective towards enhancing overall efficiency [3]. While mitigating the patient care costs, ML agents can help medical practitioners in processing important clinical decisions.

Autonomous ML agents in the past decade have become one of the most powerful transformation agents related to the healthcare industry. According to Panwar and co-researchers, in the field of workflow optimization as well as automation, these ML agents proved their effectiveness within a predictive model in healthcare services [4]. Physicians have identified that while measuring and managing big data regarding population health, the applications of ML agents have been proved to be highly beneficial. In contrast to that, in the predictive medical model, autonomous agents are used widely in global healthcare sectors for efficient medical decision-making. Moreover, while optimizing overall performance as well as increasing efficiency in operational fields, ML agents play an integral role in effective clinical growth in the future [5].

The overall research mainly focuses on the detailed analysis of various benefits regarding the application of ML agents for creating better decision-making approaches in the healthcare system. According to Panesar, in the case of numerous clinical predictions related to any critical disease determination and diagnosis procedures, ML agents have significant parts in the healthcare industry [6]. Numerous surveys have been undertaken by the researchers among hospital employees and physicians for comprehending the role of autonomous agents in medical sectors worldwide. Moreover, the research also incorporates all the advantages of implementing ML agents for clinical decision-making towards offering more predictive healthcare services.

II. LITERATURE REVIEW

Enormous healthcare sectors in the modern period have experienced a necessary demand regarding increasing positive developments in several clinical activities. According to Sahoo and fellow researchers, using the effectiveness of these autonomous agents, physicians and scientists have focused more on the applications of neural network technologies [7]. Towards managing accurate diagnosis as well as inventory, physicians tend to focus more on the use of essential machine learning agents. Researchers have observed that ML algorithms can identify any clinical risk and determine any medical anomalies at the early stage of diagnosis. Medical autonomous factors are important in the clinical industry for designing a smart patient-care approach. On the other hand, investigating and cross-checking important history of patients' records has become easier than before with the application of important ML agents.

In order to allow different on-demand medical access across vast amounts of databases, the importance of using ML agents has been analyzed by different scientists to some extent. Important autonomous clinical determinants in healthcare offer numerous algorithms that help the overall system in adopting a self-learning ability through neural networks [8]. Machine learning clinical factors are at once necessary for amplifying entire treatment quality in the sustainable future. On the other hand, autonomous determinants also aid in analyzing various external medical information over the critical conditions of a patient. As per Desai and co-researchers, all the operational practices regarding CT scans, numerous tests, X-rays, and disease screenings can be analyzed by implementing an effective predictive model in clinical practices [9]. Important ML agents can effectively regulate all the decision-making approaches as well as clinical predictions regarding disease determination and applying necessary treatment procedures. It has been identified that autonomous clinical agents can at once improve clinical accessibility in the healthcare industry. Along with this, various ML determinants help in discovering numerous major areas of healthcare services towards future improvement and directing the growth of the healthcare industry.

Today, the significance of using various ML approaches in the healthcare industry has seen a positive growth towards developing a more sustainable healthcare future. Various autonomous AI-based system agents utilize the benefits of deep learning approaches towards performing better patient care practices [10]. Modern medical sectors have observed closely the necessities of operating various ML determinants, chatbots, clinical expert systems, medical image recognition software, and disease diagnosis predictive models in healthcare. As per Shameer and other researchers, by enhancing patient engagement towards better care outcomes, various IoMT agents can at once precise all the past medical records regarding specific disease detection [11]. On the contrary, while determining various clinical issues without any errors, ML factors can at once help doctors in the smooth conduction of clinical practices. Moreover, these AI-based machine learning determinants can be used widely in treatment procedures related to radiology and cardiology for detecting various clinical issues at the initial stage [12].

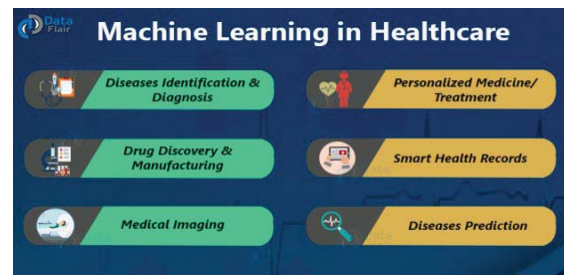


Fig. 1. Benefits of using ML agents in healthcare sectors

(Source: [12])

On the other hand, machine learning agents use important algorithms and various cognitive models related to modern medical science. While predicting patients' conditions, necessary application of treatment procedures, and disease detection, physicians tend to build a strong predictive model by using autonomous agents effectively. Wiens opines that one of the important reasons for using these ML-based factors is that these systems are capable of positive thinking, effective learning, and various important clinical decision-making [13]. These useful technical agents in the healthcare sector can interpret various clinical images effectively for a better diagnosis. On the other hand, machine learning determinants can effectively analyze big clinical data sets for a better understanding of patients' conditions and necessary treatment practices [14]. The importance of applying this predictive model strongly relates various clinical predictions towards processing effective decision-making approaches in healthcare sectors.

In order to improve both the speed and efficiency of collected medical resources, physicians tend to apply more positive approaches to ML agents in the healthcare sector. Various autonomous agents can at once pull all the patients' insights together for regulating a predictive analysis of medical practices. The structural model analysis can help medical practitioners to obtain a clear understanding quickly of patient care practices in the overall ecosystem of the healthcare industry. According to Rashidi and fellow researchers, ML technological advancements primarily use different AI systems from neural networks in order to serve patients more efficiently [15]. However, these autonomous agents can also be used in cancer detection and processing critical findings in clinical imaging.

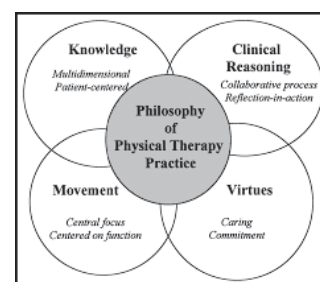


Fig. 2. Various clinical practices using autonomous ML agents in medical research

(Source: [15])

On the contrary, nowadays, detecting various medical abnormalities in various life-threatening records has become more efficient than before. While processing a predictive analysis model, ML factors can effectively diagnose arrhythmia's ups and downs in cardiac diseases. In contrast to

that, these important agents can also predict various symptoms of diseases, causes of heart attack, strokes, and outcomes of critical chronic diseases [16]. While processing any robotic surgery and other medical decision-making supports, the importance of using autonomous factors has been highly considered for clinical practitioners. Towards a better patient care conduction, these medical agents of machine learning seem to have a positive impact on the clinical virtual assistance regarding disease detection and diagnosis.

Therefore, utilizing smart ML agents in the predictive model analysis is highly beneficial for the rapid development and growth of the healthcare industry in the modern world. Researchers with Stiglic think that through implementing numerous machine learning autonomous agents, most of the medical predictions for future diagnosis have been improved over the past few decades [17]. The use of essential autonomous systems and agents related to the healthcare industry can transform essential medical practices by reducing human errors and developing the quality outcomes of serious clinical cases. Towards improving efficiency in clinical practices and tracking overtime patients' information, autonomous medical agents through a structural equation model evaluation can offer several benefits to the researchers [18]. Moreover, these machine learning determinants also aid physicians in easy understanding of various clinical predictions and decision-making approaches towards sustainable development in the healthcare future scopes.

III. RESEARCH METHODOLOGY

In order to identify the effective contributions of ML agents in healthcare decision-making and predictions, important online surveys have been effectively conducted. Effective research techniques during the global pandemic have been undertaken by the researchers after collecting opinions from physicians, nurses, and hospital staff [19]. After analyzing three relevant survey questions, all the participants' choices have been evaluated in the research study. However, around 80 participants have placed their views over the use of autonomous agents in healthcare sectors through virtual options.

However, survey questions have been created through a detailed analysis of virtual binary options by collecting necessary opinions related to the specific topic from each potential participant. Survey outcomes reflect that most of the patients and medical practitioners possess a vague viewpoint regarding the effectiveness and application of machine learning agents. Researchers show genuine interest in comprehending the effective contributions of autonomous ML agents through analyzing structural equation models for more medical benefits in sustainable healthcare opportunities.

IV. ANALYSIS AND INTERPRETATION

Important online surveys have been conducted by applying quantitative approaches for the research related to the specific topic by collecting opinions from 80 potential medical participants. Various medical resources, as well as perspectives from doctors, nurses, hospital agents, and medical scientists, have been effectively gathered for the survey. In order to comprehend the contribution of ML agents in the healthcare industry more effectively, relevant research questions have been formed and evaluated from a positive perspective-

- What are the benefits of using autonomous ML agents in increasing the performance and efficiency in the medical sectors for managing effective healthcare services?
- What is the significance of enhancing the predictive model's efficiency in decision-making approaches for clinical practitioners in the healthcare industry?

Questions related to the survey

Q1. Will ML agents be used to enhance the predictive model's efficiency in predicting future healthcare practices for sustainable development?

TABLE I. INCREASED EFFICIENCY RATE MEASUREMENT OF CLINICAL PREDICTIVE MODEL BY USING ML AGENTS

(SOURCE: CREATED BY THE RESEARCHERS)

Participants Options	Overall Participants	Response Gathered	Percentage
Agreed Strongly	80	25	31.25
Agreed	80	15	18.75
Remained Neutral	80	12	15
Disagreed	80	17	21.25
Disagreed Strongly	80	11	13.75

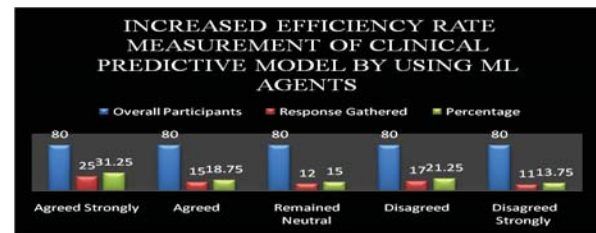


Fig. 3. Increased efficiency rate measurement of a clinical predictive model by using ML agents in healthcare

(Source: Created By the Researchers)

The above graph reflects that around 31.25% of people agreed strongly with the question among 80 participants. However, almost 18.75% of participants have agreed with a positive response. On the other hand, around 15% of people neither agree nor disagree with the survey question. In contrast to that, only 21.25% of the participants did not support the question. On the contrary, around 13.75% of people disagreed strongly with the survey topic. Therefore, key differences from strongly agreed people to strongly disagree have been evaluated effectively after calculating relevant percentages.

Q2. Do you support that effective treatment predictions and medical decision-making can be developed by the application of autonomous ML determinants for further future scopes?

TABLE II. ML AGENTS AND EFFICIENT CLINICAL DECISION MAKING RATE CALCULATION BY USING

(SOURCE: CREATED BY THE RESEARCHERS)

Options selected by participants	Total Participants	Gathered Response	Percentage
Strongly Agreed	80	35	43.75
Agreed	80	26	32.5
Neutral	80	6	7.5
Disagreed	80	10	12.5
Strongly Disagreed	80	3	3.75

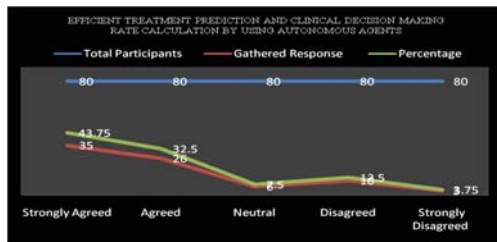


Fig. 4. Treatment prediction improvement and medical decision-making rate measurement

(Source: Created By the Researchers)

Among 80 participants of the above graph, almost 43.75% of people have strongly supported the question. On the other hand, around 32.5% of the participants agreed with the survey question. However, almost 7.5% of people did not answer positively or negatively. On the contrary, 12.5% of the potential participants did not support the topic question. In contrast to that, around 3.75% of people have strongly avoided their opinions about the validity of the particular question.

Q3. Do you think that effective ML agents' implementations are beneficial in reducing error percentages while predicting and adopting effective healthcare decision-making shortly?

TABLE III. ERROR REDUCTION RATE

(SOURCE: CREATED BY THE RESEARCHERS)

Provided Participants' Options	Total number of Participants	Collected Response	Percentage
Strongly Supported	80	29	36.25
Supported	80	13	16.25
Neutral	80	7	8.75
Disagreed	80	14	17.5
Strongly Disagreed	80	17	21.25

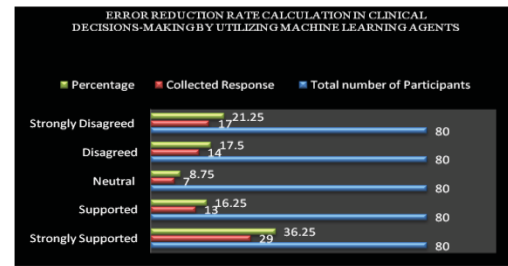


Fig. 5. Calculation of error mitigation rate in medical decision-making approaches by utilizing ML agents

(Source: Created By the Researchers)

The percentage calculation graph conducted among 80 participants shows that almost 36.25% of the people have strongly agreed with the survey question. However, around 16.25% of participants have supported the topic question. On the other hand, almost 8.75% of the participants did not agree with any of the views. On the contrary, 17.5% of people have disagreed with the question. Moreover, around 21.25% of the potential participants have strongly disagreed with the particular perspective. Measurement gaps and rate differences in the percentage calculation table are at once evident in conducting an effective survey.

V. DISCUSSION AND FINDINGS

After analyzing all the survey questions, it has been identified that participants have various changing knowledge and point of view regarding the contribution of ML agents in healthcare decision-making approaches. Analysis of the first survey question has evaluated participants' opinions about the effective utilization of autonomous agents in increasing the efficiency of clinical predictive models. However, to make important decisions for testing and detecting critical diseases, ML agents are at once important to implement effectively. As per Tonekaboni and fellow researchers, ML applications in healthcare can at once improve throughput medical facilities by operating relevant patient care services in predicting future clinical practices for further future scopes and development [17].

On the other hand, by evaluating the second question, people's perspectives on efficient treatment predictions and clinical decision-making methods can be analyzed fruitfully by using a structural equation model. Various AI-oriented autonomous agents aid physicians in diagnosing critical stages of diseases quickly with more accuracy. As per Choy and other researchers, autonomous use of machine learning determinants and their facilities can efficiently help in improving the conduction of the overall healthcare sector [18]. With the applications of ML agents, the revenue cycle, as well as the performance of the healthcare industry, can be developed by optimizing big data and clinical workflows.

The third survey question analysis at once depicts participants' points of view regarding the application of autonomous agents in the medical sector. However, the survey results evaluated from the collected clinical data reflect that machine learning agents can be effectively used in determining various clinical predictions of healthcare sectors. Apart from this, physicians have identified that in managing various administrative workflows and analysis of medical imaging, ML determinants play a major role in further improvements. As per Yu and co-researchers, ML

determinants can mitigate error percentages while predicting effective healthcare decision-making approaches in the sustainable future [19]. Effective use of autonomous agents can positively lead to a better healthcare management system soon with growing competitive advantages in the patient care industry.

VI. CONCLUSION

The effectiveness of ML agents in increasing the predictive model's efficiency in the healthcare sector by the medical practitioners has become a trending topic in today's medical science. From the overall research, it can be concluded that towards predicting necessary healthcare decisions, researchers have effectively investigated the advantages of utilizing various clinical autonomous determinants in the medical field. The entire research study focuses on conducting a brief analysis on the importance of enhancing the predictive model's efficiency by applying autonomous ML factors towards offering a better healthcare service.

The modern medical era has discovered various benefits of using machine learning determinants in processing relevant disease detection, treatment prediction, and decision-making practices. The research thus deals with promising future outcomes of healthcare practices while predicting critical conditions of patients for conducting better decision-making techniques. Therefore, researchers shed some important light on analyzing the importance of machine learning agents in the development of future predictive clinical models to some beneficial extent.

REFERENCES

- [1] V. Panwar, D. K. Sharma, K.V.P.kumar, A. Jain & C. Thakar, 2021, "experimental investigations and optimization of surface roughness in turning of en 36 alloy steel using response surface methodology and genetic algorithm" materials today: proceedings, <https://doi.org/10.1016/j.matpr.2021.03.642>
- [2] Ghazal, T.M., Hasan, M.K., Alshurideh, M.T., Alzoubi, H.M., Ahmad, M., Akbar, S.S., Al Kurdi, B. and Akour, I.A., 2021. IoT for smart cities: Machine learning approaches in smart healthcare—A review. *Future Internet*, 13(8), p.218.
- [3] Panesar, A., 2019. *Machine learning and AI for healthcare* (pp. 1-73). Coventry, UK: Apress.
- [4] Sahoo, A.K., Pradhan, C. and Das, H., 2020. Performance evaluation of different machine learning methods and deep-learning based convolutional neural network for health decision making. In *Nature inspired computing for data science* (pp. 201-212). Springer, Cham.
- [5] Fadhil, A., 2018. Beyond patient monitoring: Conversational agents role in telemedicine & healthcare support for home-living elderly individuals. *arXiv preprint arXiv:1803.06000*.
- [6] Desai, R.J., Wang, S.V., Vaduganathan, M., Evers, T. and Schneeweiss, S., 2020. Comparison of machine learning methods with traditional models for use of administrative claims with electronic medical records to predict heart failure outcomes. *JAMA network open*, 3(1), pp.e1918962-e1918962.
- [7] Kalagara, S., Eltorai, A.E., Durand, W.M., DePasse, J.M. and Daniels, A.H., 2018. Machine learning modeling for predicting hospital readmission following lumbar laminectomy. *Journal of Neurosurgery: Spine*, 30(3), pp.344-352.
- [8] Shameer, K., Johnson, K.W., Glicksberg, B.S., Dudley, J.T. and Sengupta, P.P., 2018. Machine learning in cardiovascular medicine: are we there yet?. *Heart*, 104(14), pp.1156-1164.
- [9] Vellido, A., 2019. The importance of interpretability and visualization in machine learning for applications in medicine and health care. *Neural Computing and Applications*, pp.1-15.
- [10] Wiens, J., Saria, S., Sendak, M., Ghassemi, M., Liu, V.X., Doshi-Velez, F., Jung, K., Heller, K., Kale, D., Saeed, M. and Ossorio, P.N., 2019. Do no harm: a roadmap for responsible machine learning for health care. *Nature medicine*, 25(9), pp.1337-1340.
- [11] ncbi.nlm, (2022): The potential for artificial intelligence in healthcare, available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/> [Accessed on 24th January 2022]
- [12] Rashidi, H.H., Tran, N.K., Betts, E.V., Howell, L.P. and Green, R., 2019. Artificial intelligence and machine learning in pathology: the present landscape of supervised methods. *Academic pathology*, 6, p.2374289519873088.
- [13] fda.gov, (2022): Artificial Intelligence and Machine Learning in Software as a Medical Device, available at: <https://www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-software-medical-device> [Accessed on 24th January 2022]
- [14] Stiglic, G., Kocbek, P., Fijacko, N., Zitnik, M., Verbert, K. and Cilar, L., 2020. Interpretability of machine learning-based prediction models in healthcare. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 10(5), p.e1379.
- [15] Noguerol, T.M., Paulano-Godino, F., Martín-Valdivia, M.T., Menias, C.O. and Luna, A., 2019. Strengths, weaknesses, opportunities, and threats analysis of artificial intelligence and machine learning applications in radiology. *Journal of the American College of Radiology*, 16(9), pp.1239-1247.
- [16] Kumar, S. and Singh, M., 2018. Big data analytics for healthcare industry: impact, applications, and tools. *Big data mining and analytics*, 2(1), pp.48-57.
- [17] Tonekaboni, S., Joshi, S., McCradden, M.D. and Goldenberg, A., 2019, October. What clinicians want: contextualizing explainable machine learning for clinical end use. In *Machine learning for healthcare conference* (pp. 359-380). PMLR.
- [18] Choy, G., Khalilzadeh, O., Michalski, M., Do, S., Samir, A.E., Pinykh, O.S., Geis, J.R., Pandharipande, P.V., Brink, J.A. and Dreyer, K.J., 2018. Current applications and future impact of machine learning in radiology. *Radiology*, 288(2), pp.318-328.
- [19] Yu, C., Liu, J., Nemati, S. and Yin, G., 2021. Reinforcement learning in healthcare: A survey. *ACM Computing Surveys (CSUR)*, 55(1), pp.1-36.