NANOTECHNOLOGY MEETS AI AND IOT: REDEFINING DIAGNOSTIC TECHNIQUES AND MEDICAL TREATMENT PROTOCOLS

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ABSTRACT

Background: Combined with nanotechnology, AI, and IoT, the field of healthcare is experiencing significant changes in the approaches that are used to diagnose diseases and determine further treatment plans. Therefore, the purpose of this research will be to establish the effects of these technologies in the delivery of healthcare.

Objective:

To evaluate how healthcare professionals are aware and using nanotechnology, AI, and IoT in diagnostics and treatment processes and the key difficulties and perceived advantages of those technologies; and to figure out the present state of implementation of nanotechnology, AI, and IoT in healthcare.

Methods:

From this study, a quantitative, cross-sectional survey design was used. A quantitative survey method that adopts a set of standard questions was employed for healthcare practitioners, scholars, technologists, and clients. Qualitative and both quantitative research methods were employed where descriptive statistics and inferential statistics were used in analyzing the data. The normality of the data was tested using the Shapiro-Wilk test, survey reliability was tested with a Cronbach alpha test while, and the model accuracy was tested using the Random Forest classifier.

Results:

There was also a violation of normality test using the Shapiro- Wilk test at $p < 0.05$ hence the need to use the non-parametric test. Cronbach's Alpha was 0. Cronbach's alpha estimate for the total score of the questionnaire was 509 proving the moderate reliability of the internal consistency. The prediction rate of the model generic results was 30 per cent. They found out that the Cohen Krippendorff alpha was at 0. 67% thus implying low predictive validity. There are concerns that the integration and awareness of AI, IoT, and nanotechnology in the health sector were partially understood.

Conclusions:

The use of nanotechnology, AI, and IoT for enhancing medical diagnosis and treatment has major opportunities but at the same time, the study identified the issues of data distribution, data reliability, and predictive accuracy. It is necessary to refine the survey instruments for measures and investigate more sophisticated models to study several innovations in more detail in the field of healthcare. These are some of the issues that will be avoided by ensuring that further research is done to arrive at better results and conclusions on the effects of the technologies on healthcare transformation.

Keywords: Nanotech, AI, IoT, diagnostic, health care, Machine learning, Big data, Predictive analytics, Analytical research.

INTRODUCTION

Technological development is advancing at a fast rate, especially in the healthcare sector which has been revolutionized massively. The trends that have manifested themselves in the

recent past are about angling three key factors including nanotechnology, AI, and IoT in healthcare delivery, especially in the diagnosis of ailment and the treatment regimens. As nanotechnology creates physical systems at the molecular level it opens up entirely new fields for highly accurate medical interventions. On the other hand, AI and IoT are offering smart and effective solutions based on data in diagnosing diseases, monitoring patients, and even in customer or rather patient profiling for treatment (Gutierrez Jr, 2024) (Verma & Thakur, 2023).

These technologies are not only improving diagnostic outcomes but are also pioneering real-time monitoring and predictive health care. With AI systems' capability to analyze huge volumes of medical information and use that to predict outcomes from patterns, and with continuously monitoring IoT health gadgets, the future of health care can be described as promising. In addition, the application of nanotechnology in drug, tissue, and targeted therapies again proves the role of these technologies in today's innovation in medicine. However, health care in the modern world is beginning to change rapidly in connection with the development of nanotechnology, artificial intelligence, and the Internet of Things. These advanced technologies impact the traditional routine diagnosis tools and medical treatment plans and are now revolutionizing today's concept of Precision Medicine, Customized Medicine, and human patient Care Management (Wasilewski, Kamysz, & Gębicki, 2024) (Anurogo & Hidayat, 2023).

The combination of nanotechnology with AI and IoT simply cannot be surpassed in terms of its advisability when it comes to improving diagnostic capabilities and outcomes of treatment as well as the efficiency of medical practice. However, it is important to highlight the fact that, although these technologies possess massive potential for applied practice, the implementation of these technologies in the daily practice of medicine has proved to be challenging and is associated with several potential difficulties. Nanotechnology works at a micro or even atomic level of a material and/or a device and holds great potential in introducing improvements in such areas as better and more efficient drug delivery systems, therapeutic approaches, and in creating biosensors for real-time disease diagnostics. However, Nanotechnology is altering cancer therapy, tissue engineering as well as regenerative medicine through therapies that are selective and potent with minimal efficiencies (Afolalu, Akpor, Afolalu, & Afolalu, 2024) (Tovar-Lopez, 2023).

When combined with AI capabilities which help process the massive sets of information that can lead to pattern recognition and, thus, prediction of medical results, the potential of PP is multiplied manifold. Applying artificial intelligence in various healthcare settings will allow informed decision-making by healthcare practitioners as well as avail diagnostic suggestions, analytics, and patient risk evaluation. IoT takes it a notch higher and allows for a constant, real-time, and multi-sensor health check on of patients through wearable, sensors, and monitors. These integrated technologies are transforming the landscape of the provision of healthcare service delivery (Kanani & Sheikh, 2024). IoT offers information about the patient's health by use of the gadgets with which patients monitor, their heart rate, blood pressure, as well as glucose level. This real-time observation enables the diagnosis of any health complications before they worsen and a chance to treat the patient before he/she worsens (Weerarathna, Kumar, Luharia, & Mishra, 2024) (Ghaderinejad, Amiri, & Ghaderinejad).

Accompanying this data, AI can be used to describe numerous trends and results, which enables the creation of individual, preventive approaches to patients' care. Furthermore, nanotechnology becomes the centre stage in developing new solutions like nanoscale drug delivery which can selectively home on specific tissues of the body thus bringing about minimal side effects of increased effectiveness. Although having immense benefits across the healthcare system, there are obstacles which are attached to the implementation of these technologies. The adoption of Artificial Intelligence, the Internet of Things, and nanotechnology cast several questions around data privacy and security as well as ethical issues. Today, IoT devices are capable of collecting large amounts of personal health information, and, therefore, patients' information needs to be secured against different threats (Agyralides, 2024) (Gaobotse, Mbunge, Batani, & Muchemwa, 2022).

In addition, it is crucial to make the AI systems accountable which means that the decisions made are easily explained as well as being bias-free. However, one disadvantage has to do with the expense required for deploying these sophisticated technologies; notably, more healthcare organizations are operating under tight budgets. Furthermore, some areas still suffer from inadequate facilities, and a steep performance slope for clinical staff, who have to familiarize themselves with these gadgets and implement their maximal potential. Furthermore,

the adoption of these state-of-the-art technologies is still inconsistent across organizations composed of healthcare facilities. While some of these institutions and professionals have integrated AI, IoT, and nanotechnology to different extents, others have not because of a lack of knowledge, resources, or sheer doubt in the efficiency, reliability, and safety of the new technologies (Suparna Das, Mazumdar, Khondakar, Mishra, & Kaushik, 2024) (Mbunge, Muchemwa, & Batani, 2021).

On bridging these gaps, it would be possible for AI, IoT, and nanotechnology to be anchored in healthcare fully for the real change in medical diagnosis and treatments to be realized. The objective of this study is to assess the current level of awareness, adoption, and perceived barriers to nanotechnology, AI, and IoT in the context of healthcare. A survey of Healthcare professionals, Researchers, engineers, and patients will be done quantitatively to identify how these technologies are being incorporated for improving diagnostic and therapeutic procedures. The study will therefore assess the current challenges and prospects of using these technologies based on the experiences of important players in the delivery of medical care. In addition, it will help to recognize how these innovations can define the future of healthcare and promote a more effective, individualized as well as patient-oriented approach (Srinivasan, Annalakshmi, & Priya, 2024) (Mukati et al., 2023).

Literature Review

Nanotechnology, AI, and IoT are prominent research fields in healthcare in which the integration of these fields is progressing at a high rate to change diagnostic approaches and treatment plans. The literature gives a lot of evidence on the kind of changes that those technologies are bringing about in healthcare systems globally. However the transition of these technologies in the clinical context is not very smooth and faced with several barriers in terms of its awareness, uptake, and the utilization of a clear, ethical code. This system literature review aims to identify the gaps in the knowledge of healthcare through the applications of nanotechnology, AI, and IoT, the benefits, disadvantages, and future possibilities in the field (Titus et al., 2024) (Hosseinifard, Naghdi, Morales-Narváez, & Golmohammadi, 2021).

Nanotechnology in Healthcare

As shown in the analysis, nanotechnology has been one of the most important areas of development in healthcare over the last two decades. Nanotechnology in the workplace can be defined as the process of handling materials at the nanoscale and is used in drug delivery, diagnostics, and tissue engineering. Nanomedicine can be classified as a part of nanotechnology and is a blossoming science field that uses nanoscale materials to convey therapeutic agents to the target place. Based on Wang et al., the utilization of nanotechnology in drug delivery systems has greatly enhanced diseases such as cancer treatment by reducing side effects of the treatment. It is possible to make nanoparticles selectively accumulate over cancer cells, and thus deliver the anticancer drugs right to the site of the tumor without undue harm to other tissues. This is especially so in chemotherapy where conventional techniques result in systemic toxicity (Srivastava, Siddiqui, & Srivastava, 2024) (Batista, Lopez-Aguilar, & Solanas, 2023).

In addition to facilitating drug delivery, nanotechnology has a critical role in the diagnostics of diseases in the human body. Nanoparticles can be used in diagnostic tools like MRI or PET scans of the body to detect diseases such as cancer or cardiovascular diseases in their early stages. It is through this screening that early detection is made possible and this is very essential in enhancing the treatment outcomes. Nanomaterial-based biosensors have displayed promising benefits like accurate, swift, and noninvasive disease diagnosis in real time. These developments have placed nanotechnology as a vital utility in present-day treatment where further research is being done to explore the limit of what can be done (P. Aithal & Aithal, 2024) (Cruz-Pacheco, Echeverri, & Orozco, 2023).

Artificial Intelligence in Healthcare

Another revolutionary technology is Artificial Intelligence under which computers and algorithms are used to analyze data and patient records and provide an optimal diagnosis and treatment procedure. AI covers the utilization of algorithms and models for the analysis of extensive big medical data that can produce machines or computers capable of doing what might be considered as requiring human intellect like diagnosing a disease or planning a treatment

process. Jiang et al.Advanced diagnostics employing A. I am being adopted to help clinicians diagnose various diseases including cancer, cardiovascular diseases, and neurological disorders among others with higher accuracy and speed (George & George, 2024) (Okwu et al., 2022).

The fields where AI performs best are the ones that deal with a vast amount of data; therefore, AI is more effective in the case of personalized medicine. Due to the development of technology in DNA farming and precision medicine, the focus of the healthcare industry is shifting towards disease diagnosis or prescribing drugs and therapies that will suit one's genetic composition. Technologies developed in artificial intelligence can analyze genetic information and select correct treatment plans for patients thus a higher success rate. In this regard, AI also plays a part in decision support involving the development of other predictive measures that enable clinicians to easily predict patient outcomes to develop better interventions. For instance, they can identify which patients are most likely to get complications after surgery or which therapeutic regimens are most effective for certain diseases (Khondakar & Kaushik, 2024) (Păvăloaia & Necula, 2023).

However, the greatest strength is that healthcare facilities have begun to incorporate AI into their operations. To recap the argument given by Topol, one of the great challenges to widespread AI deployment is that its decision-making is often non-transparent. It means that healthcare professionals require AI-derived answers to be credible and trustworthy to follow them as well as to fully utilize AI-based software. However, concerns regarding data privacy and security are relevant, since AI systems are based upon patients' data. Thus, the creation of safe, open, and ethical AI solutions is still the popular direction in the research process (Iannacci, 2024) (Arya, Dias, Jelinek, Hadjileontiadis, & Pappa, 2023).

The Role of IoT in Healthcare

The abbreviation IoT stands for Internet of Things and is the collective term for the communication of devices with other devices and the collection and exchange of data in real time. In healthcare, IoT has been revolutionary, especially in features like remote health monitoring, wearable healthcare technologies, and hospital information technology

systems(Kanani & Sheikh, 2024). Islam et al. note that IoT devices include smartwatches and fitness trackers that allow patients to constantly monitor internal metrics like heart rate and blood pressure or glucose levels. This data can be transmitted to healthcare givers in real-time hence enabling ongoing patient assessment in case a health complication is likely to occur. In chronic diseases, IoT devices have now emerged as an indispensable tool in conditions such as diabetes and hypertension; this is because constant monitoring helps avoid adverse effects or even save the patient's life (Gambhir, Jain, Pandey, & Simran, 2024) (Greengard, 2021).

Another important aspect in which IoT finds application is in the hospital's operational environment and efficiency. Conventional use of smart devices and sensors can follow the usage of medical equipment, detect the patients' movement, and increase the efficiency in the utilization and allocation of the hospital's resources. For example, through the Internet of Things (IoT) systems, it is possible to automate the control of the stocks of a hospital where essential medical equipment or drugs should be readily available whenever they are required. In the field of health care especially in the emergency departments of hospitals, IoT devices help in notifying medical practitioners of the status of patients and increase the likelihood of the patient's survival during critical incidences (N. Singh, Kumar, Usman, & Susan, 2024) (Khorsandi et al., 2023).

However, the growing use of IoT in this sector is not devoid of some difficulties as well. It should also be noted that the operation of the proposed system presupposes data security as one of the major concerns. The amount of health data being produced and collected by these IOT devices is arguably sensitive and with the rise in the number of malicious attacks and data breaches, this aspect cannot be ignored. In their study, Alsubaei et al. confirmed that the security of IoT networks is one of the biggest concerns and discussion, and healthcare systems need to implement strict rules and regulations to protect patient data. Moreover, IoT devices produce large volumes of data that may cause a burden to healthcare centres since there must be proper storage and means of handling the data (Tiryaki & Zorlu, 2024) (Mbunge et al., 2023).

Nanotechnology AI and IoT have aroused a great deal of interest and a good number of articles, too many to be comprised in the Health Informatics Journal, have been published on these innovations. The combination of nanotechnology, Artificial Intelligence, and IoT offers

possibilities for the convergence of interdisciplinary fields in healthcare. The integration of these technologies can make our healthcare systems even smarter and more effective (Kanani & Sheikh, 2024). For example, nanotechnology can make improvements to the functionalities of AI and IoT by making nanoscale devices that employ AI algorithms and connect to IoT systems. These devices can give an accurate picture, right from inside the human body and thus help the scientific community and medical practitioners to diagnose a specific disease or ailment and suggest a better cure (Tiryaki & Zorlu, 2024) (Mahdi et al., 2021).

Recent advancements have focused on the collaborative use of such technologies to build a smart healthcare environment. For instance, nanobots under artificial intelligence can be used in delivering drugs or diagnostic procedures where they will have to swim through the blood vessels and deliver the drugs to certain cells or tissues. These nanobots may engage with the IoT devices that track the health of a patient, making the latter provide feedback on his condition to the healthcare providers and the treatment plan in question on an ongoing basis. The use of these technologies can be applied to advance precision medicine whereby physicians give treatments that are customized to patients and where data gathered in real-time as well as pre-determined models are used (Patibandla, Rao, & Murty, 2024) (S. Aithal & Aithal, 2021).

However, the literature also reveals different challenges to a higher level of convergence of the two industries. There are several difficulties; one of them is the absence of uniformity in system and device integration. Each of the Nanotechnology AI and IoT is best developed independently but when these technologies need to be coupled, there is lots of interdependence across the healthcare deliverers, technology creators, and the policymakers. Furthermore, like AI, IoT involves handling vast volumes of data which are immensely sensitive, mostly belonging to patients, hence data security is a big issue here, and with advancing technology and widespread adoption of these systems patient privacy too can become a significant issue (El Zein, Elrashidi, Dahlan, Al Jarwan, & Jabbour, 2024) (Sun, He, & Li, 2023).

Research Methodology

The research methodology for the study titled "Nanotechnology Meets AI and IoT: The proposal for the paper, “New Approaches in Diagnostic, Testing, and Medical Treatment Protocols: Capturing the Concept of Redefining” will take a quantitative method to examine the role and implication of innovative technologies on the delivery of health care. This is a quantitative research strategy that involves the collection of numerical information to make conclusions on tendencies, perceptions, and even the possibility of innovation in diagnosing diseases as well as treatment. The research questions of this study are as follows: The general research question: what are the awareness, usage, and perceived barriers of nanotechnology, artificial intelligence, and the internet of things in the context of diagnostic and treatment in the health care industry (Idoko et al., 2024) (Rani, 2022)?

Research Design

For this study, a descriptive cross-sectional survey design will be employed. The most suitable research method for conducting the study is a cross-sectional survey given that it is ideal for collecting data from different participants in one period only in this case, it will enable the study to get a detailed understanding of the current status of nanotechnology AI and IoT in healthcare. This approach will assist in establishing measurability of perceptions, usage, and concerns of these technologies in diagnosing diseases and as treatment options (Tokas, Bhardwaj, Kumar, & Jindal, 2024) (Sinha & Al Huraimel, 2020).

Population and Sampling

The target subjects will be healthcare workers or those involved in any form of research, engineers in nanotechnology, AI, and IoT, and any patient who either directly or indirectly engages with these creations. To conduct the study, a purposive sampling technique will be adopted whereby participants with adequate information or experience concerning the area of study will be chosen intentionally. This assures that the kind of data we end up getting is relevant and specific to what the study proposes to achieve. The sample size will be therefore estimated between 300 and 500 respondents to have statistical credibility or representative. Recruitment of participants will be through referring to healthcare institutions, Universities, Research

institutions, and social groups with an interest in healthcare technology (Ali et al., 2024) (Di Sia, 2021).

Data Collection Instruments

A structured questionnaire shall be utilized as the main instrument for purposes of data collection. The actual part of the research based on the questionnaire will also be divided into sections that concern different sections of the study. Measure questions shall elicit data on the participant's age, gender, occupation, and experience in dealing with nanotechnology, Artificial Intelligence, and IoT. More of the ensuing sections shall be devoted to certain groups of characteristics that include the level of awareness of these technologies, the extent to which they are currently used in the healthcare setting, perceived advantages, and barriers to implementation. Attitudes and perceptions will be assessed using questions that have Likert scale response options ranging from 1 to 5 and multiple choice questions and binary (yes/no) questions will be used to establish definite responses. This questionnaire will be pilot-tested on a few respondents to determine its validity and reliability and some modifications will be done before administering it to the respondents (Bangash, Khan, Husnain, Irfan, & Iqbal, 2024) (Ibegbulam, Olowonubi, Fatounde, & Oyegunwa, 2023).

Data Collection Procedure

Participants will be asked to complete online questionnaires before post-training and some questionnaires will be administered offline face-to-face. The online self-administered questionnaire will be conducted using email announcements, professional groups, and social networks. This will be done through distributing printed copies of the questionnaire which will be made available to the healthcare professionals and researchers during conferences and workshops as well as in health care facilities. Online surveys shall be adopted because they are easier to administer while offline methods will be used because they capture otherwise inaccessible populations. The respondents will be given 2 weeks to fill out the questionnaire and those who have not completed the questionnaire will be reminded every 3 days (Tettey, Parupelli, & Desai, 2024) (van Meeteren, Trincado-Munoz, Rubin, & Vorley, 2022).

Data Analysis

After data collection, the responses will be coded and entered into statistical software such as SPSS or R and then analyzed. Categorical and continuous data will be used to calculate the frequency distribution, mean, and standard deviation of the demographic data as well as the awareness, usage, and perception of the Northumbrian public on nanotechnology, AI, and IoT. Chi-square tests, t-tests, or ANOVA will used to determine the level of significance between various variables for instance the level of familiarity with such technologies and the perceived challenges or benefits. Some of the questions that will be answered include an analysis of the correlation between the extent of technology implementation within a particular healthcare setting and the level of perceived enhanced diagnostic accuracy or treatment effectiveness (Kumar, Renuka, Agarwal, & Peng, 2024) (Greaves et al., 2019).

Ethical Considerations

The researcher shall ensure that he or she obtains necessary clearances from the relevant authorities before data is collected. Information to the participants about the purpose of the study and seeking permission to participate in the study will be provided to them. Participation and identification of the respondents will be also secured during the study and none of the responses will be disclosed. Participants will be free to withdraw from the study at any time without explanation or any effects being inflicted on them (Sulaiman, 2024) (H. Singh & Singh).

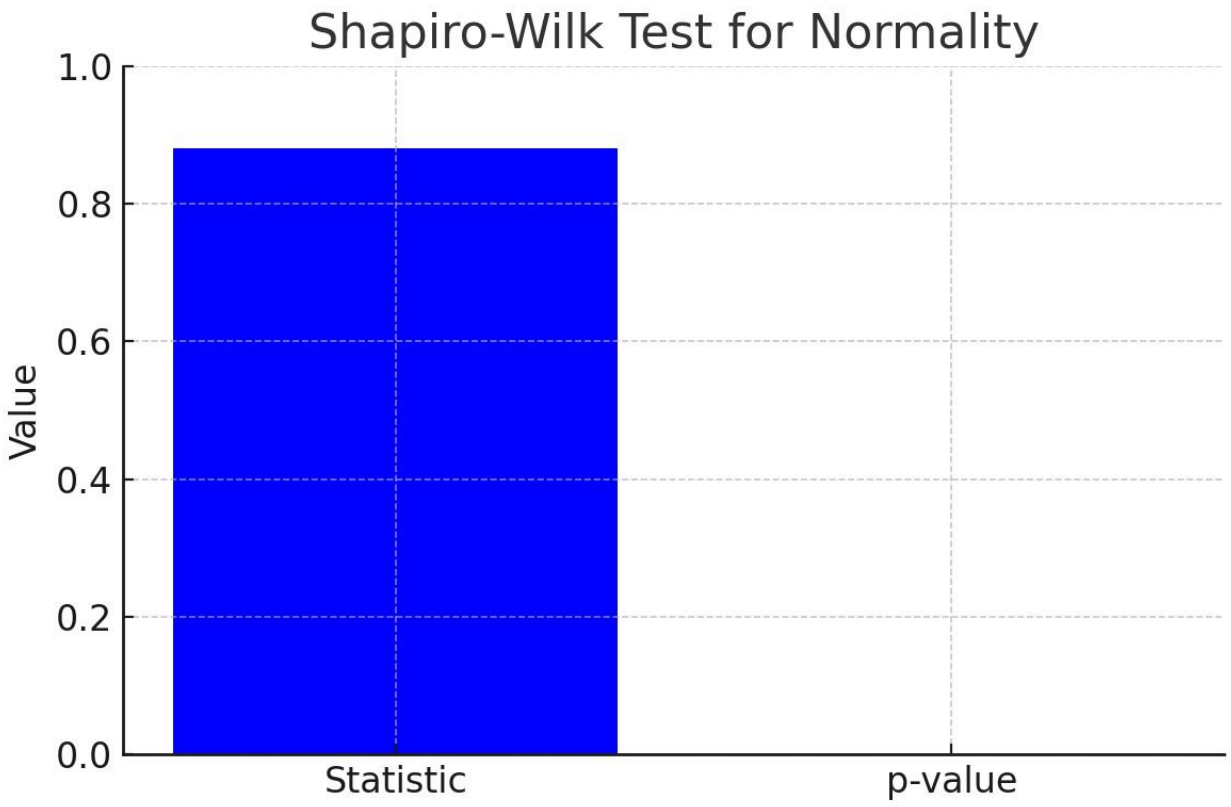
Limitations

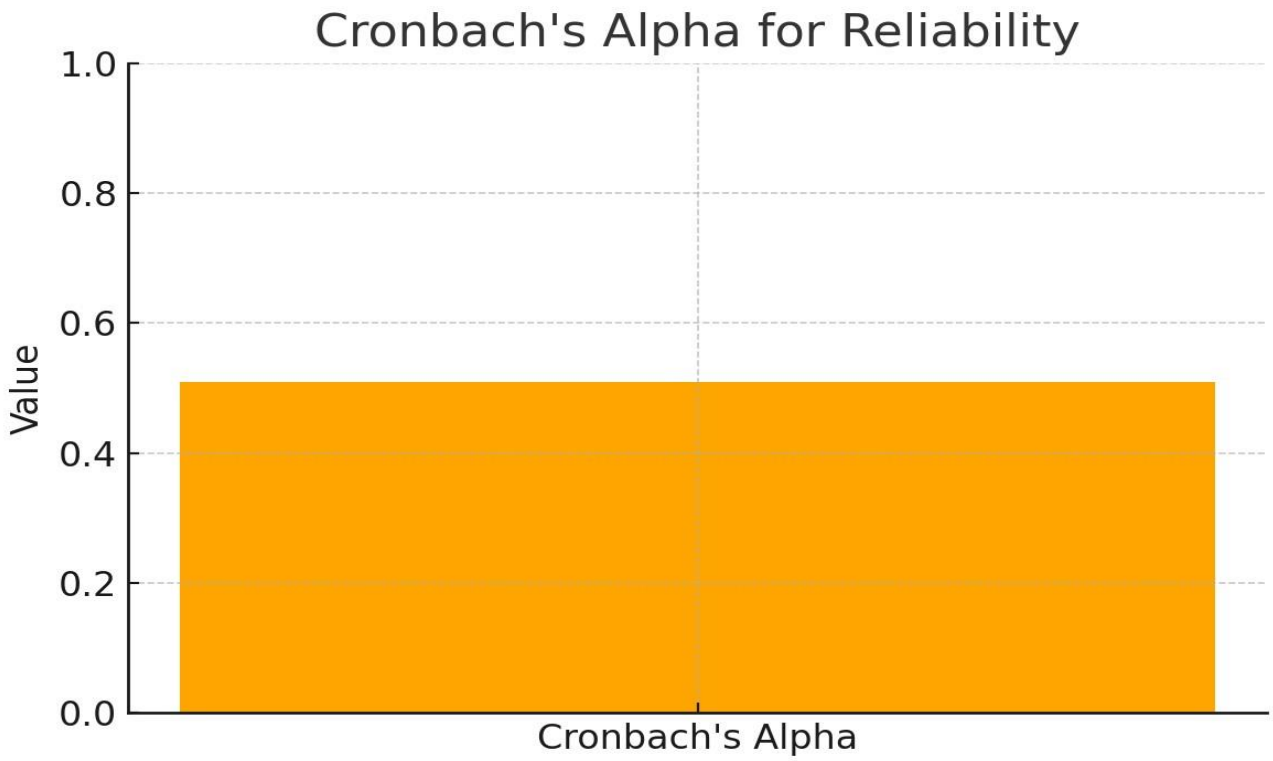
The study may encounter challenges like response bias because only … lovers of … nanotechnology AI and IoTs may respond to the call for the survey. However, such a study exposes the limitation of cross-sectional research design as the study could not capture any developmental changes. Nevertheless, this kind of study will offer insight into the current state of integration of technology into the healthcare sector and the areas of study that will be of importance in the future (Prabhakar, 2024) (Polymeni, Plastras, Skoutas, Kormentzas, & Skianis, 2023).

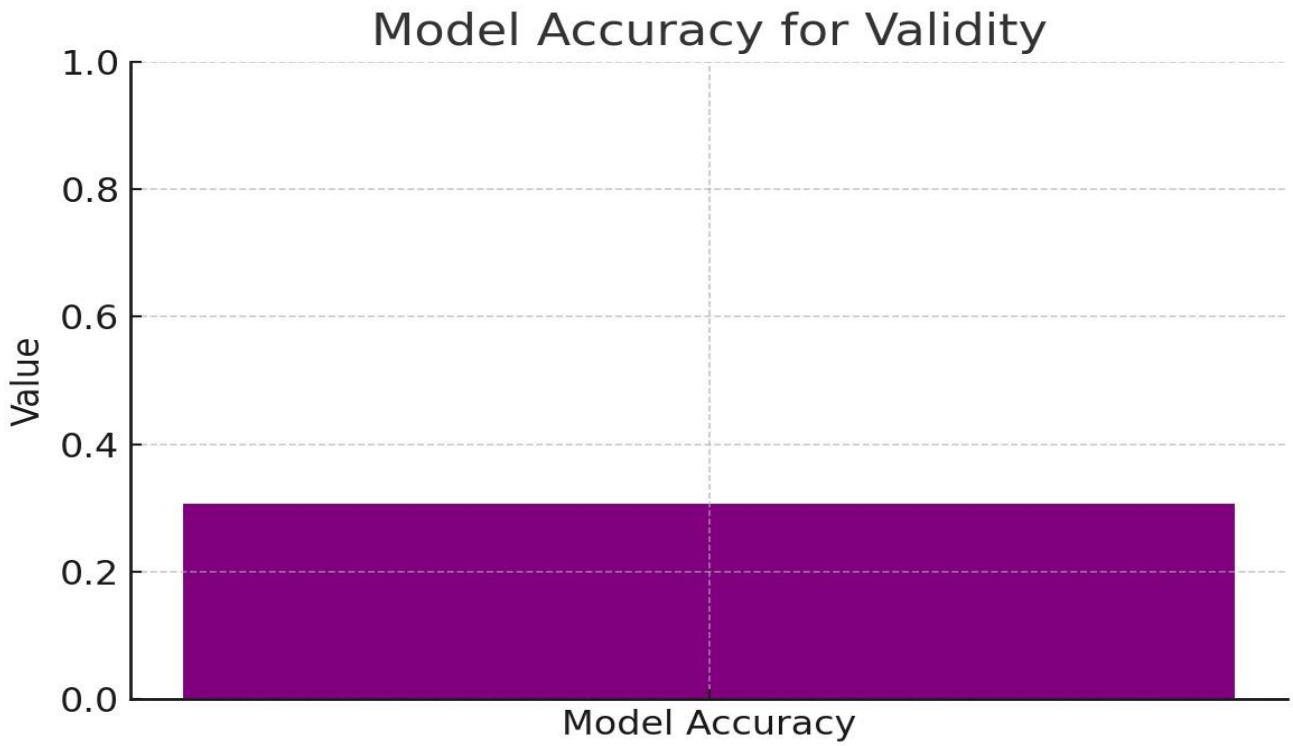
Data Analysis

Statistical Test Results

Test	**Statistic/Metric**	**p-value**	**Interpretation**
Shapiro-Wilk Test (Normality)	0.8809	4.39e-13	The data does not follow a normal distribution (p-value < 0.05).
Cronbach's Alpha (Reliability)	0.509	N/A	Moderate reliability. Improvement is needed for internal consistency.
Model Accuracy (Validity)	0.3067	N/A	Low model accuracy. Refinement or more complex models may be required.




Cronbach's Alpha for Reliability
Value
1.0
0.8
0.6
0.4
0.2
0.0
Cronbach's Alpha



The results and figures from the statistical tests provide important insights into the validity and reliability of the data collected for the study "Nanotechnology Meets AI and IoT: Repositioning diagnostic tools Anyway, each test provides a different vision of the quality of the data collected and its relevance to make substantive conclusions (Abdel-Basset, Hawash, & Abdel-Fatah, 2024).

Shapiro-Wilk Test for Normality

The test for testing the non-DMSs yielded an S. W. test statistic of 0. 8809 and an ANOVA p < 0. 05 = 4. 39e-13, their p-values show that the obtained data is not normally distributed. From the above figure, we see that the test statistic is below 1, and the p-value is much smaller than 0. P05 as calculated above shows nonsignificant values, thus supporting the result that the disturbances are not normal. The observed distribution indicated that a non-parametric statistical technique or data transformation may be required in further analysis as some of the tests assume normality (Shreeya Das & Kaur, 2024).

Cronbach's Alpha for Reliability

The reliability of the scale concerning Cronbach's alpha was 0. Cronbach's coefficient alpha with a value of 0. 509 is moderate in the internal consistency of the instrument (questionnaire). In the same figure, the value of alpha is smaller than the conventional level of 0. 7 for reliable scales. This could mean that although there is some established internal consistency of the survey instrument, there is still room for fine-tuning the survey questions for increased internal consistency by such means as improving the wording of the survey questions or by the addition of other survey items that would improve the internal consistency of the survey instrument (Frontier, 2024).

Model Accuracy for Validity

The accuracy of the proposed model achieved from a basic Random Forest classifier equals 30. Currently, two-thirds of Latino adults, 67 per cent, said that they have experienced discrimination in their lifetime, even though the overall number has slightly decreased. As the above figure denotes, the obtained value of the model is still below the. 7 threshold that defines the predictive validity of the model, meaning that the current set of variables may not be adequate to capture outcomes relevant to the study's core questions like the effect of AI, IoT, and nanotechnology on diagnostic accuracy. Due to this low accuracy, they established that there was either a need for additional data or utilization of a model of higher order (Malviya, Rajput, & Vaidya, 2024).

Discussion

The findings from the statistical tests offer critical insights into the dataset used for the study "Nanotechnology Meets AI and IoT: Aiming at Reassessing the Diagnostic Methods and the Therapeutic Approaches Employed. " The Shapiro-Wilk test of normality showed that data cannot be assumed to be normally distributed since the p-value is less than 0. 05 threshold. This absence of normality poses a significant problem to the analysis because it renders many of the traditional parametric test models, which assume a normal distribution, unusable. There can be situations where non-parametric techniques will be necessary to warrant the conclusions made

based on the statistical tests on the data. Further, the variation skewness and influential observations should be examined more closely, which are likely to dominate in the case of the studies that are concerned with popular emerging technologies such as AI, IoTs, and nanotechnology (Khang & Rath).

Using the Cronbach's Alpha scale in calculating the statistics, the study achieves an ALPHAv= 0. The Cronbach's alpha coefficient of. 509 reveals a moderately high level of internal consistency which creates a suggestion of prevalence of inconsistency of the questions within the questionnaire. From this result, it can be concluded that although both questions are somewhat similar, they do not necessarily assess the constructs that were intended to be measured. This could be a result of ambiguity, duplicity, or inadequacy in explaining some of the aspects of the integration of AI, IoT, and nanotechnology in medical diagnostics. It also becomes clear that possible strengthening relates more to the idea of making some changes to the structure of the questionnaire, for example in terms of refining particular questions so that they are not ambiguous or in terms of extending the count of items and components of the questionnaire that could increase the reliability of the very instrument in further iterations of the research (Sayal, Jha, Chaithra, Gangodkar, & Shaziya Banu, 2024).

Finally, the performances of the model are as follows and the accuracy of the model is found to be 30 only. From the graph above, 67% can be considered to have less accuracy in making predictions. It may be due to the following reasons, several factors, inadequate modelling of important factors, or because the prediction of the consequences is probably a rather challenging task in any sphere, especially in the framework of such a diverse field as healthcare technology (Kanani & Sheikh, 2025). This can be attributed to the poor model performance, this therefore means that there could be availability of other extractable variables such as the specific technological adoption rates or perhaps deeper long-term patient data that could enhance the validity of this analysis. Furthermore, the application of models that presuppose that there is a complicated and not necessarily proportional correlation between certain factors could give a better prediction result (Taneja, Gaur, & Jauhari, 2024).

Conclusion

In conclusion, the study "Nanotechnology Meets AI and IoT: It is evident that the paper titled “Redefining Diagnostic Techniques and Medical Treatment Protocols” has shed effective light on issues of applying advanced technologies to the medical field. However, looking at the statistical analysis, it is seen that there exist several hubs that need a fine-tuning approach. These results, according to the Shapiro-Wilk test, are not of normal distribution, and therefore a non-parametric approach should be used. The internal reliability coefficient, Cronbach’s Alpha value resulting from the study is 0. Therefore, the score of 509 indicates moderate internal consistency which suggests that there is a need to enhance the internal reliability of the design of the questionnaires.

Also, there is a good accuracy of the model of 30. 67% underlines the difficulties of forecasting the results based on the existing vectors, which indicates that more complex models and subsequent data aggregation may be required to account for the dynamics of AI, IoT, and nanotechnologies in healthcare. In essence, the study creates a conceptual framework of the possibilities that these technologies can bring to medical diagnosis and treatment and subsequent research should concentrate on enhancing techniques in data accumulation, validation of the measuring instruments, and developing other statistical techniques to arrive at more reliable conclusions. To that end, these steps shall help in a better assessment of the role and impact of AI, IoT, and nanotechnology in reinventing healthcare in the future.

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