

Data Governance in Healthcare AI: Ensuring Transparency and Trust

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Abstract – The advancement of Artificial intelligence has opened a new window for the public institutions to adopt automated work-process. Healthcare sectors have been facing consequences of digitalization due to their inclination over modern technologies for maintaining healthy patient care. AI-driven solutions are beneficial for health systems in prediction of probable consequences and automation of work-process but this comes along with challenges in data security and trustworthiness. The introduction of transparent and interpretable AI models and tools can enforce reliability and dependency on advanced intelligence technologies. By addressing the ethical challenges strictly, automation systems will be able to bring revolution in the public sector like healthcare and agricultural departments. The study provides an evaluation on the implementation of statistical analysis to determine how data governance practices are carried out in healthcare AI. Due to the fact that AI has occupied a prioritised position in the field of healthcare, it becomes necessary to develop concern on transparency and trust. The statistical analysis has been carried out using MS Excel to undergo analytics of datasets collected from healthcare settings. Findings from the study implies that the use of data governance helps in protecting privacy and confidentiality of patient records stored across institutions offering services through AI.

Keywords – Artificial Intelligence, data analytics, transparency, descriptive statistics, correlation, ANOVA, decision making.

I. INTRODUCTION AND BACKGROUND

Artificial Intelligence is advancing at a high speed, leading to transformation across various sectors that cover healthcare and finance to education sectors and the enforcement of law. As AI systems have become influential in the decision-making process, their ethical implications have become concerning. The automation process which is enforced by AI faces difficulties when the governance comes into consideration [1]. The data governance process encompasses factors like data integrity and availability to usability and security that requires strict attention from organizations and meets legal requirements. Transparency of AI refers to the clarity about the working process of AI systems that describes how the AI technologies process data and contributes in efficient decision making. The lack of data transparency becomes difficult for stakeholders to trust and understand the outcomes generated by the AI systems.

AI tools provide solutions in a straightforward manner that could be lacking in depth-inquiries which compromise the critical thinking ability of students [2]. The 'black-box' aspect of AI systems has been one of the concerning factors for businesses as they are not able to conclude how the models meet the conclusion due to lack of exposure in the AI systems. The rapid growth of AI in recent years has also influenced the healthcare sector by a technological breakthrough in treatment and diagnosis hereby accompanying risk factors in the healthcare department [3]. Ethical issues have been observed that compromise trustworthiness in medical AI that can be resolved by strict authentication and governance processes. This paper aims at ensuring a trustworthy and secured medical AI system on ethical aspects. We are looking forward to analysing whether the technologies are reliable or not and their application level to highlight factors that affect the trust of individuals benefitting them to carry out favourable decisions beneficial for businesses.

II. RELATED WORK

Explainable AI(XAI) has been flourishing in the recent days providing transparency about decision-making AI models especially that performs deep learning and other complex algorithms falls under black-box. Model category which promotes limitations for stakeholders to derive conclusions about how these models end up with certain decision which results to mistrust in adoption of AI technologies [4]. In order to address these situations Explainable AI aims to resolve these issues by providing clear-interpretable solutions along with enforceable explanations for AI based results. Data governance is essential for health organizations for counterchecking of measures implemented on the stakes of patient health. Minor errors in decision-making can critically compromise patient health as well as the reputation of the institution.

AI-driven technologies can impose potential threats for healthcare in terms of patient safety, and hard governance methodologies that require standards and regulations which are internationally accepted [5]. The warrant of AI driven solutions in healthcare is much more stringent controlled involving in the discussions among individuals. In order to minimise biases the application of AI models enforcing that vulnerable communities are not disproportionately affected by certain AI decisions. However, to explain AI-generated diagnosis, it is necessary to gain vital knowledge for healthcare professionals to be familiar with the underlying objective behind the diagnosis [6]. XAI significantly faces challenges in which complex models generate high performances but cannot be interpreted well whereas simpler AI models are much more transparent but might sacrifice accuracy. This also faces challenges in delivering desirable explanations which varies from individual to individual and XAI faces difficulties in deliverance of universally satisfactory explainable techniques [7].

The utilisation of AI can offer efficient solutions in favour of healthcare however; it lacks trustworthiness when it comes to patient safety. AI systems that are transparent in nature enforces human-AI interaction that is advantageous in building trust among individuals about AI-driven methodologies. Though XAI aids in instances like mitigating and identifying bias AI models, they fail in capturing complex decision-making models likely leading to misinterpretation. [8]. The collaboration of policy makers and technologists can lead to an environment that allows ethical development and deployment of AI models. Transparent and openness of AI models fosters AI reliability and can open a new window for healthcare organisations in ensuring patient reliability and trust. On considering alternative means to deliver trustworthy mechanisms, developers can present easily interpretable models, decision trees and linear models, which promote transparency about the work processes of the systems [9].

III. METHODOLOGY AND THEORETICAL FRAMEWORK

A. Data collection method

Methodological framework is the most important factor for guiding the evaluation of the research and understanding its influence in the business world [10]. Concerning the research topic called the role of data governance in healthcare artificial intelligence, ensuring trust and transparency, the data was collected through a random selection of 50 professionals of the healthcare system who have hands-on experience in acknowledging the role of data governance through artificial intelligence in healthcare, assuring transparency and trust. The 50 professionals were acknowledged with a questionnaire through the conduct of a survey. The evaluation of the scholarly article outlined that the survey can evaluate valuable data and information, along with acknowledging the population, behaviour and conditions most effectively and accurately [11]. The conduction of the survey here was highly but immaculately fruitful in understanding the implementation of data governance in healthcare through artificial intelligence. Their responses were further put to the test through the conduct of various tests using MS Excel, which will be discussed in the next section.

B. Analysis of the method

The analysis of the methods is a form of interpreting the technique of data collection, which is crucial for developing an effective outcome of the research. The collected data was interpreted through the use of MS Excel and conducting tests such as descriptive statistics, correlation analysis, and ANOVA. The presented tests were effective in understanding the importance of data governance in healthcare through artificial intelligence and evaluating the dataset further to understand the perception of the healthcare professionals through a critical analysis of their hands-on experience in this matter.

In a general context, ethical considerations are very important in enhancing the morality of the research [12]. Therefore, the integration of ethical consideration in this study was effective in presenting an information sheet and consent form to the participants to understand all the information and gain clarity about the research topic. In addition to this, the consent form has presented the participants with the right to back out of the survey and proposed to keep the data and information anonymised and confidential. In addition to this, they are to be de-identified post the conduction of the research.

IV. EVALUATION OF THE FINDINGS IN THE FORM OF DISCUSSION

C. Descriptive statistics

The descriptive statistics have been effective in understanding and summarising the data distribution. The implementation of a descriptive statistic shows the summarisation of a set of organised data used for gaining insights into the dataset. However, the accuracy constraint of the application of this statistical measure eventually depends upon the type of metrics used for the calculation. For instance, the utilisation of a mean medium and mode provides an indication of the basic statistical inferences that can be drawn for a large set of data. The implementation of this measure in healthcare AI can provide insights into the changes that can be brought upon in the data governance practice. For this purpose, a set of graphs and charts have been generated to determine how insights into Healthcare AI can be provisioned.

$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

Where,

\bar{X} is the representation of the mean of the variables
 n is the representation of the tidal number of observations

X_i is the representation of each individual valuation of the data.

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

The formula is the representation of the standard deviation, where,

X_i is the representation of each of the values.

\bar{X} is the representation of the mean

n is the complete sample size

TABLE 1: DESCRIPTIVE STATISTICS

Categories	AI Model Name	Data Quality Score	Bias Index	Transparency Score	Governance Complexity Level	Audit Frequency per Year	Explainability Score	Ethical Risk Level	Patient Trust Score
Mean	2.76	85.5	0.50	79.00	1.74	3.18	71.60	2.6	78.3
Standard Error	0.20	1.25	0.04	1.81	0.11	0.21	2.02	0.09	1.69
Median	0.00	84.50	0.55	83.00	2.00	3.00	74.50	3.00	83.00
Mode	1.00	95.00	0.50	79.00	1.00	3.00	75.00	2.00	95.00
Standard Deviation	1.41	8.81	0.27	12.82	0.78	1.49	14.30	0.60	11.96
Sample Variance	1.98	77.60	0.08	164.47	0.60	204.53	0.36	143.03	
Estimate S.E.	1.27	1.21	0.04	1.81	1.11	2.21	3.07	1.23	1.23
Skewness	0.17	0.00	-0.04	-0.20	0.50	-0.32	-0.11	-1.36	-0.27
Range	4.00	28.00	0.96	38.00	2.00	4.00	69.00	2.00	39.00
Minimum	1.00	72.00	0.50	79.00	1.00	3.00	70.00	1.00	79.00
Maximum	5.00	99.00	0.97	98.00	3.00	5.00	99.00	5.00	99.00
Sum	138.00	427.00	24.89	1981.00	87.00	159.00	3780.00	131.00	4027.00
Count	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Confidence Level(95.0%)	0.40	2.50	0.08	3.64	0.22	0.42	4.06	0.17	3.40

The table was responsible for the presentation of dispersion and central latency across 50 observations. It suggested that most of the hospitals have experienced high data quality with clustering of means. The scholarly evaluation of the data and information indicated that artificial intelligence brings advanced analytical techniques that are critical in raising the standards of ethical concerns and safety, leading to the accumulation of high-quality data [13]. Similarly, the table has also orchestrated a bias index with a standard deviation being 0.27, showcasing considerable viability. Connecting with the scholarly valuation of the author, it is observed that biases in AI are common; they can affect the process of clinical decision-making

[14]. AI in healthcare has the capability to bring biases into the process of data governance. The governance and compliance level, followed by explainability and patient trust, have outlined clustering of variables, a broad spread of data and comparative stability. Again, connects with the scholarly valuations; trust is the most important factor in enhancing the data governance framework within the infrastructure of healthcare [15].

D. Correlation analysis

Correlation analysis has been recognised as a statistical measure that helps in describing the strength between two variables by establishing an interrelationship with them. The direction of the two variables represented through the graph determines a positive correlation which denotes the increase in one variable with a directly proportional relationship with the other. Contrarily, the representation of a negative correlation is done by stating the fact where the direction of values of two variables is opposite to each other. However, correlation does not only caution due to the fact that the two variables commonly relate to a value between 0 and 1 with a positive and a negative implication.

$$r = \frac{(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{(X_i - \bar{X})^2 (Y_i - \bar{Y})^2}}$$

The Pearson Correlation was effective in understanding the correlation between the variables.

The formula has represented the following:

Where,

X_i and Y_i are the representations of the paired observations, showcasing the correlation between the two variables.

\bar{X} and \bar{Y} bar are the representations of the respective means.

r is the representation of the coefficients of correlation.

When $r > 0$, then it is a positive correlation.

$r < 0$, then it is considered to be a negative correlation.

$r = 0$, then there is no linear relationship observed

TABLE 2: CORRELATION ANALYSIS

	AI Model Name	Data Quality Score	Bias Index	Transparency Score	Governance Complexity Level	Audit Frequency per Year	Explainability Score	Ethical Risk Level	Patient Trust Score
AI Model Name	1.00								
Data Quality Score	-0.06	1.00							
Bias Index	0.68	0.05	1.00						
Transparency Score	0.02	-0.06	-0.31	1.00					
Governance Complexity Level	0.02	0.26	-0.03	-0.13	1.00				
Audit Frequency per Year	-0.08	0.14	0.24	0.05	-0.03	1.00			
1 Year									
Explainability Score	-0.02	-0.34	0.17	-0.19	-0.22	0.00	1.00		
Ethical Risk Level	0.20	-0.01	0.07	0.05	-0.35	0.08	0.17	1.00	
Patient Trust Score	0.14	-0.06	0.17	-0.07	-0.47	-0.20	0.11	0.14	1.00

A weak relationship among the variables observed through the evaluation of the data through correlation, thus suggesting the independent functionality of the data governance in the area of healthcare. A minimal correlation was observed from the score of data quality, while biases and transparency have outlined a slight negative correlation. The accumulation of data and information has outlined that artificial intelligence is a powerful tool in not only streamlining the workforce but also maintaining accuracy [16]. However, transparency and biases have remained a challenge. In addition to this, it has also been observed that the

compliance level of governance and patient trust is lower. Distrust due to poor data governance is common as a result in healthcare due to the lack of central authorisation towards data sharing and resistance towards the acceptance of technology among the patients [17]. Therefore, the weak coefficient implied the poor presentation of trust aligned with the findings related to healthcare data governance through artificial intelligence.

E. Anova

ANOVA analysis has been recognised as one of the most effective statistical measures that enables measuring of the variances that lie within two or more variables present in the dataset. The inclusion of an ANOVA analysis enables examining two or more groups in such a way that the differences between their values can be calculated. Variability between groups provides indication on the low p-value, which typically lie within 0.05 value, indicating the differences. In this paper, the implementation of a one-way ANOVA has been performed to provide indication on how healthcare AI. Using the inferences that has been gained from this analysis, it has been possible to state how the business decisions made within the healthcare setting can be administered with proper transparency and privacy. This has been formulated from the data obtained from the healthcare dataset thus providing indication on how the improvements can be implemented.

$$F = \frac{MS_B}{MS_W} = \frac{SS_B/(k-1)}{SS_W/(N-k)}$$

The different significance of the mean scores is represented through the use of this test. The following are the representations of the variables:

F is the representation of F-statistics outlining the ratio of the variances.

SS_B is the representation of the summation of squares that outlines the due variance of various groups.

SS_W is again the presentation of the summations within the groups, considering the variation of the groups.

MS_B is the presentation of the mean square between SS_B/(k-1)

MS_W is known as the mean square within SS_W/(N-k)

k is known as the number of groups.

n is the total number of observations.

The interpretation outlined that the high valuation of F with a p-value less than 0.05 is a suggestion of significant differences within the group means.

TABLE 3: ANOVA ANALYSIS

ANOVA: Single Factor					
SUMMARY					
Groups	Count	Sum	Average	Variance	
AI_Model_Name	50	138	3	2	
Data_Quality_Score	50	4275	86	78	
Bias_Index	50	24	0	0	
Transparency_Score	50	3983	80	164	
Governance_Compliance_Level	50	87	2	1	
Audit_Frequency_per_Year	50	159	3	2	
Ethicality_Score	50	1580	76	205	
Ethical_Level	50	131	3	0	
Patient_Trust_Score	50	4027	81	143	
Total	71027.69	449.00			

The evaluation of the data and information from the ANOVA table indicated that explainable artificial intelligence has strong significance in enhancing the data governance capabilities within the healthcare valuation of AI. In a more specific order, a strategic significance was observed between the variables, thus indicating that data governance in healthcare artificial intelligence can ensure trust and transparency.

Therefore, the complete evaluation of the data and information indicated that, despite the negative factors, data governance in healthcare artificial intelligence is effective in enabling trust and transparency with clarity.

V. LIMITATIONS

F. Technical Limitations

The influence of AI in healthcare has led to the identification of unique threats and the need for the intervention of ethical frameworks. In the clinical work process, AI models operate with their 'black-box' nature, where healthcare experts find difficulties in the interpretation of decision-making processes, and professionals lack reliability in them. Taking instances into consideration where convolutional neural networks (CNNs) are instrumental in the medical imaging process. AI-powered radiology tools are used for the detection of tumours in MRI scans, where there lack of clear explanation about the prediction of tumour. As a result, healthcare professionals cannot come to a satisfactory conclusion, which interrupts the decision-making process. One of the main issues is the need for an explainable and interpretable AI model [18]. On top of that, AI is highly reliant on patient data, which imposes potential risks to data privacy and results in cyber-attacks.

G. Regulatory Limitations

AI is generally trained on large datasets, and when these datasets portray historical biases or inequalities, the AI models are bound to replicate these biases. This can result in an unjustified conclusion, which can severely affect the sensitive data of patients if efficient monitoring of processes is not carried out. Critical decision-making is an essential factor for health organisations. Slight inaccuracy in the predictive analysis process can risk public health, which is unaffordable for health service providers. When the AI development process is transparent, the biases can be identified with ease, promoting reliability in the health sector. This can lead to the inclination of health sectors to adopt automation measures and foster innovation among health sectors.

H. Ethical Limitations

Limited access is provided to AI in accessing broad and external datasets, and this imposes limitations on AI models in the execution of functions like medical imaging. Importantly, data is the main component for the training of AI models, which compromises the

security of patients' sensitive data. Confidential datasets that include patient data are likely to be exposed to cyber threats. Improper utilisation of AI can cause inaccurate diagnosis and unsuitable suggestions of treatment. Various malpractices can occur when an enormous amount of data is handed over to an intelligent system. The privacy of patients and individuals gets compromised. Patient biometrics comes under the exposure of malpractitioners who can impose a serious threat on patients.

VI. CONCLUSION AND FUTURE WORK

I. Conclusion

The research has conveyed the influence of Artificial Intelligence in healthcare organisations and the concerns leading to its implementation in the health sector. This has portrayed the potential of AI tools in the management of clinical trial data, with consideration of some aspects like data integration and a transparent overview of AI models, ensuring data security [21]. Frameworks need the intervention of the latest technologies, like Explainable Artificial Intelligence, for the validation of decision-making processes and present them in a secure, interpretable method. Privacy-friendly training models need to be incorporated across multiple nodes of the healthcare system without making the data centralised [22]. Future frameworks might look forward towards various innovative approaches to cross-border data communication with legal or regulatory demands in exchange. The region-sensitive modules can enable businesses to operate in international ecosystems with legality and security. AI models can be instrumental in the detection of anomalies in patients, and quick precautions can be implemented at initial stages, hence safeguarding the patient's health. Transparency acts as the key pillar in the building of a trustworthy AI system. Data governance process is a necessity in health organisations for stakeholders to carry out efficient decision strategies because AI systems lack trustworthiness. The swift AI development requires an update of the AI governance process. AI systems can uphold value in the healthcare department when they start addressing vulnerabilities like biases and security. It is also necessary for multiple individuals to address the AI risks and social impacts to foster the digitalisation of healthcare sectors to stand out in the digital era.

J. Future Work

Artificial Intelligence Systems like IBM's Watson benefit from effective clinical decision making [19]. AI systems use patient data to provide effective solutions for patient care. In the future, AI will be implemented by clinic professionals to get inspiration for efficient decision-making. Healthcare departments will look out for an automated working landscape that will substitute traditional patient-care systems. When the Artificial Intelligence models are able to ensure the validity of

processes and prove their reliability in the health sector, there would be no alternative available than to adopt the automation processes. Data pre-processing techniques need to be developed for addressing biased models in order to ensure clarity in AI models [20]. Advanced systems will be using the facility of a multi-cloud environment. This will ensure the scalability of the Explainable Decision Engine and lead to the sustainability of large-scale high-frequency scenarios. Future development is focused primarily on the development of optimisable, strong and intelligent automation models that will be privacy-conscious and inclined to correctness.

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