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The empirical analysis in using the machine learning approaches for effective health care decision making in Emerging Economies using Multiple regression analysis

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ABSTRACT

Numerous elements tend to restrict the administration of developing economies to utilize healthcare resources effectively. The poor health result is very attributed to this reason. The idea of this study is to properly analyses the importance of machine learning to make effective decisions in the domain of emerging economies. The study has effectively employed multiple regression analysis to effectively conduct the study. The researchers have effectively taken two dependent variables and two independent variables to conduct their study effectively and the result they put forward was satisfactory in this particular context as the variability of the dependent variables was completely aligned with the independent variables. This research paper briefly discussed the positive and negative aspects of machine learning in various countries too. Here in the literature review point carries out the comparing view of the journals about the topic of ML and AI in the healthcare sector. The important point which has been discussed here is, applications of artificial neural networks in the health care organizations for decision making is the new scope as it improves the delivery of care at a minimum reduced cost and Artificial intelligence with multifunctional machine learning platforms developed better health care systems and precision medicines.

KEYWORDS: machine learning, emerging economies, multiple regression analysis, healthcare, decision-making

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INTRODUCTION

Numerous elements such as ineffective employment of medical resources are presumed to be core reasons for poor health hazards in different emerging economies. "The world health" report demonstrates that around forty per cent of medical resources are getting wasted in the developing economies. The scarcity of resources is very much prevalent in the world. However, there is no doubt that medical care efficiency is basically the assimilation of output, financial hazard protection and patient satisfaction with effective employment *"Data development examination" (DEA)* or *"stochastic frontier examination" (SFA)* [1].It is important to note that the shift in the epidemiological curve enables the emerging economies to struggle in the face of different healthcare hazards as the pattern changes in the domain of chronic diseases are putting enormous financial pressure on the emerging and developing countries. Among the thirty fours organizations associated with the OECD nations, different researchers examined the efficiency of the medical infrastructure by efficient employment of machine learning tools such as *"Decision-making units" (DMU)* [2].Different variables were put forward in this particular context such as the number of hospital beds and medical expenditure per capita. Whereas the output was calculated with the variables of child mortality ratio and life expectancy during birth. An efficient example can be mentioned in this scenario; the medical literacy was increased due to the efficient decision making of the Slovak Republic after the successful implementation of machine learning. Many researchers have commented on the hindrance of corruption in the healthcare sector effectively and they also concluded

that malicious corruption effectively influences medical accessibility considerably and it is essential to take serious steps. Another set of researchers commented on the condition of the Slovak republic with the efficient assistance of a machine learning tool known as *"Data envelope examination" (DEA).* Here two distinct inputs were put forward as the variables such as the number of healthcare professionals in the country and medical beds. However, multiple variables were considered in this scenario such as different medical gadgets, *"computed tomography tools"*, *"magnetic resonance tools"* and many other things. This study effectively concluded through that machine learning tool that the countries with lower variables tend to maximize their medical potency as time progresses [3].This paper is going to analyses the employment of machine learning for efficient healthcare decision making in developing economies through effective employment multiple regression analysis. Ahmed, *et al.* has commented that artificial intelligence with multifunctional machine learning platforms developed better health care systems and precision medicines [4]. On the other hand, Shahid *et al.* mentioned that applications of artificial neural networks in the health care organizations for decision making are the new scope as it improves the delivery of care at a minimum reduced cost [5]. The use of artificial intelligence is still limited in various countries. Yet the application of AI in the health care sector is rapidly growing every minute. AI and machine learning can easily aggregate several sources of information. For example, it can be stated that the AI-powered ***remote-controlled robotic surgery, Clinical decision support system*** and many other functions. Developed country like the United States, United Kingdom is growing day by day as they implemented Artificial intelligence not only in the business sectors but also in the health care sectors. This will increase their economic growth also [6]. The power of I can easily solve serious issues related to dangerous diseases. Moreover, through AI it will be easy for the medical staff, nurses and doctors to make an emergency decision as early as possible with the help of AI.

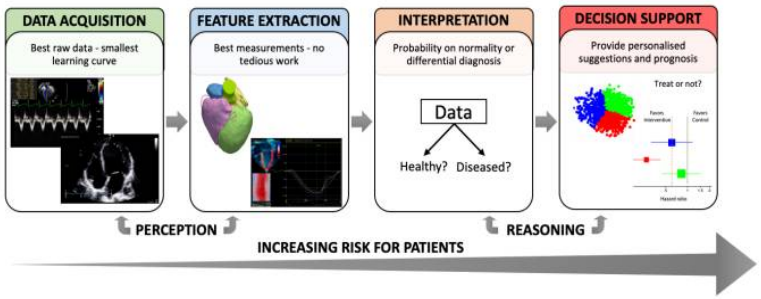

Figure 1. Various tasks where Machine learning can support clinical decision making

The benefit of Machine Learning for acquiring the data, high-quality information by the smallest learning curves without human intervention [7]. The main focus is on the CT scan, PET, MRI scan and many others gives correct image models to identify the problem from the root and stars the treatment. Healthcare organizations are adopting the techniques of machine learning such as ANN or Artificial Neural Networks and are increasingly used for healthcare management decisions. The healthcare system in the developed countries transformed towards the value-based, patient-centered model of delivery of care. AI lies at the nexus of the new technology with the potentiality of delivering proper care, cost-effectiveness and delivering appropriate care in real-time. ANN can be applied in all levels of health care organizations and their decision-making procedures as well. Decision-makers are taking advantage of the hybrid model of ANN for the proper solution to the given problems. Successfully adoption and implementation of the ANN may be required for the improved understanding of social, ethical and economic implications in the health care organization decision makings [8]. Moreover, the growth of the healthcare sector, the economic growth of various countries and the positive and negative side of the perfect use of ML and AI and the negative par for not properly utilizing these are described here briefly.

Nevertheless, Machine learning has been applied in the field of medicine for real-time patient monitoring, data mining, disease classification implement of wearable and personal devices, modelling big data which is based on engine recommendation, some the reported contributions include diagnostic the mental illness, detecting the knee osteoarthritis, diagnostic Alzheimer's diseases, predicting metabolic pathway, healthcare cost prediction, identification of social and economic factors and many others[9]. Role of Artificial Intelligence in traditional healthcare data analysis and in precision medicine. However, machine learning allows to build models in order to analyses various data and delivers appropriate result. It also leveraging historical as well as real time data. In the healthcare sectors with the help of the machine learning provides better decisions about the diagnoses if the patients. It helps to identify the proper treatment for the patients. This also improves the service of the healthcare. It will help in immense

growth of the particular sector as well as economic growth of a nation. The countries which utilize ML and AI in the health care sectors grows rapidly and the death rate also decreased in those particular countries. Machine learning is essentially a programming that mimics the human learning pattern with great accuracy and consistency. Health care sector could find uses for the Machine learning for the purpose of observation and keeping of records and case studies for reference of the healthcare professionals to be used for guidance in cases of medical issues that are rare [10]. Artificial intelligence aided Machine learning is capable of giving the medical professionals more depth in their research as the intelligent software recognizes the symptoms and conditions by analyzing thousands of scientific literatures in a matter of minutes to give the healthcare professionals advice and suggestions on the course of actions that the healthcare workers can review and use if they find it suitable.

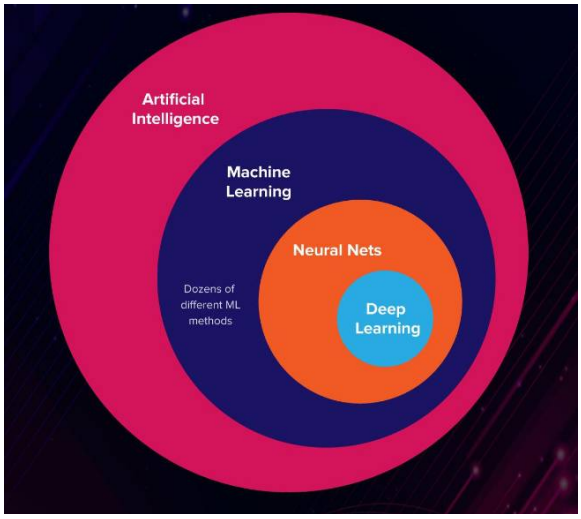

Figure 2. Working principle of Ai aided ML

In the UK and Norway for example AI aided machine learning is being used to test the medical technologies. This has little to do with application on humans but is used to evaluate the technologies and predict their effectiveness. These two nations are also using AI to build robots that are capable of remotely monitoring the patient and their health condition [11]. These kinds of technologies are of extreme importance in treatment of contagious diseases such as COVID and others that may come in the future. They may prove to be effective when it comes to the treatment of the patients with minimal contact with the patients.There are other ways the application of these technologies can be achieved. These would be smart system monitoring and data evaluation. These can be done for existing technologies such as the CT scan and MRI scans. At the present, in various countries that are not so advanced in medical technologies, healthcare professionals need to manually create the reports analyzing the results using rudimentary software. The application of AI aided machine learning could in this case prove to be a great addition to the inventory of the healthcare facilities that can analyze the result variables of complex medical reports and interpret them accurately.

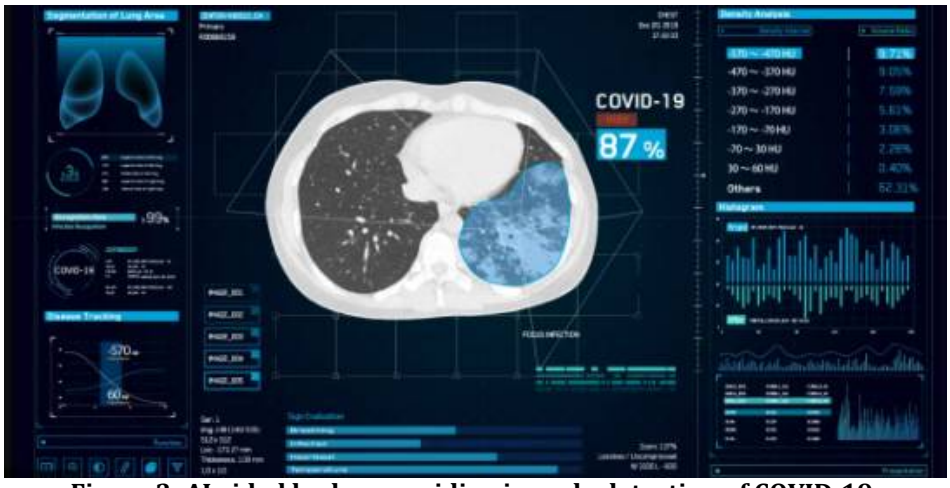

Figure 3: AI aided body scan aiding in early detection of COVID-19

In China, some hospitals have already started using AI and machine learning technology for the early detection of COVID-19. The early detection of COVID 19 is very important and the smart systems are linked with the other test and record software to detect the COVID virus presence in the body of an individual even before the symptoms manifest [12]. People have greatly benefitted from these kinds of early detection techniques as the treatment started before the symptoms got worse. Mentioned earlier is the use of robots for remote monitoring of patients. There also exists an integrated technology capable of doing multiple tasks, capable of multiple applications not just for COVID but other health conditions and diseases as well.

The use of AI aided Machine learning in developing countries are increasing as the innovations happen and more AI and Machine Learning hardware and software gets developed and the technology gets more and more affordable for the smaller organizations to use them. The use of AI and ML technologies are not widespread in the developing countries but they do exist in small numbers. The other reason for that is that the labor intensive conditions of the developing countries. Ai and ML aided technologies are threatening towards employment as it takes roles of humans. This factor is beneficial for the European countries as the population there is falling. However for the many developing countries where the population are not falling but on the rise, the application of AI is going to further add to the employment problem [13]. There are drawbacks as well as advantages to the AI aided Machine Learning technologies as is with all technologies.

The ML and AI are often used together that aids in the easier application of the ML in various human activities. The human brain has the power of application called the IQ or Intelligence quotient that is mimicked by the AI or Artificial intelligence, responsible for the application of knowledge, analysis and understanding to product an output. While the human brain also has a library of memories that are well sorted and organized. Tis function is mimicked by the Machine Learning process as the ML learns and sorts using patterns of frequency, and observations. The ML and AI together is a potent process that can aid humans in many fields including the medical field.

METHODOLOGY

To effectively put forward the effectiveness and efficiency of the *"empirical analysis in using the machine learning approaches for effective health care decision making in Emerging Economies using Multiple regression analysis"* a quantitative and a qualitative approach has been taken to predict the efficient result in this particular domain. It is important to mention here a statistical analysis is put forward by the research group to effectively comprehend the relation between variables in this particular context to completely grab the proper understanding of the importance of machine learning for effective decision making in the developing economy in their healthcare sector [14]. In this particular study, 2 dependent variables and 2 independent variables were undertaken by the researchers in this particular context. Here the researchers have taken multiple independent variables and two dependent variables effectively. The researchers mainly targeted developing countries of South America to analyses how machine learning assist in their healthcare-related decision making. The researchers have chosen Nigeria, Guatemala, Mexico, Argentina and Brazil. All the country has a developing economy.

The researchers have also chosen year as an independent variable. The researchers aim to analyses the employment of machine learning in the last five years in those developing countries for healthcare decision making. The researchers have taken the percentage of increased medical bed and use of machine learning as dependent variables. These variables effectively assist the study group to analyses the relationship among the different variables [15]. It is also essential to mention that the researchers have effectively put forward multiple regression analyses to comprehend the relationship among the variables efficiently and systematically. The researchers have collected numerous data associated with the dependent and independent variables. Multiple data set was gathered in four different compartments so that a multiple regression model can be utilized in this particular scenario. Even though the year was taken as an independent variable. Only data from the last five years has been collected to maintain the authenticity of the study. Multiple regression is basically an extension of linear regression and researchers have utilized it to assess relations among multiple variables so that this particular topic gets more clarity. The multiple regression model is utilized as the researchers wanted to predict the value of dependent variables based on the independent variables. The variables that the researchers are trying to predict is known as dependent variables and the through which the research tries to interpret the value of dependent variables is called independent variables. The researchers have utilized this to indulge multiple variables to comprehend the importance of machine learning in the medical decision making of developed countries.

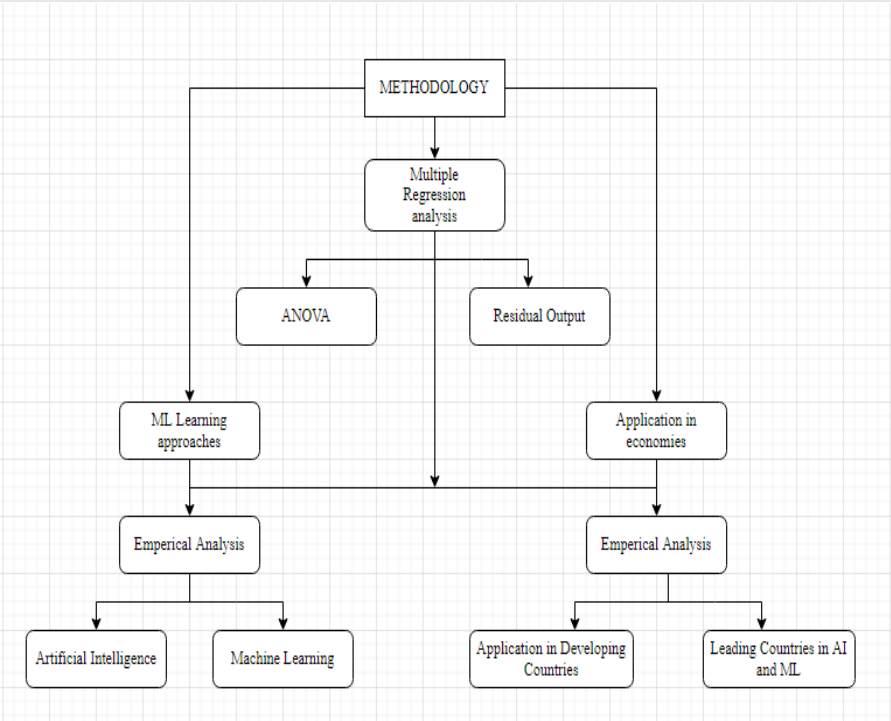

Figure 5: Flowchart

RESULT

The statistics related to SPSShas systematically put forward multiple tables of results in this particular domain of multiple regression analysis. It can be effectively seen that three core tables are needed to comprehend results from the framework. It is important to assume that no assumption has been tempered in this due process. It is important to interpret the complete output sets to gain a better understanding of the scenario. Effective scatter plot and histogram have also been deployed in this particular study to gain better comprehension.

TABLE 1: SUMMARY OUTPUT

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.926366
R Square	0.858154
Adjusted R Square	0.574461
Standard Error	2.10868
Observations	4

The R column effectively represents the digit associated with the R. It is known as the *"multiple correlation coefficients".* It can be incorporated to be one element of the attribute to predict the value of the dependent variables the researchers put forwards. It also put forward the idea of the quality of the variables in this particular context. Through the above table, it can be effectively stated that the value of the multiple R is recorded as 0.926366. It is considered a good value and it also put forward a good level of prediction. This means the employment of machine learning effectively assist the medical decision making of the country. The R square is regarded as the coefficient predictor in this particular context. The gives a clear idea about the deviation of the variance of dependent variables that can be interpreted through the effective employment independent variables. Here the value of R square is recorded as 0.8581. It can be effectively stated that independent variables put forward around 85.81% variability of the dependable variables. It effectively states that the researchers have been vehemently successful in employing independent variables. This high percentage rate also assists the researchers to interpret the data more accurately in this particular multiple regression guide.

TABLE 2: ANOVA

ANOVA						
	df	*SS*	*MS*	*F*	*Significance F*	
Regression	2	26.90097	13.45048	3.024939	0.376625	
Residual	1	4.446531	4.446531			
Total	3	31.3475				

The F ratio in this particular table effectively assists if this particular regression framework is a good adjustment for the selected date. The table effectively demonstrates how the independent variables effectively and statistically put forward the result of dependent variables. The value of the F is recorded as 3.02, *p<.0005.* It effectively demonstrates that the regression framework the researchers put forward is basically a good fit for this particular data.

TABLE 3: COEFFICIENT TABLE

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	-4895.75	2035.083	-2.40568	0.250798	-30753.9	20962.43	-30753.9	20962.43
2016	2.430749	1.009335	2.408268	0.250555	-10.3941	15.25557	-10.3941	15.25557
4.3	-0.54134	1.38382	-0.3912	0.762609	-18.1244	17.04175	-18.1244	17.04175

According to coefficient table, the unstandardized coefficient tends to examine how much the dependent variables tend to fluctuate when distinct independent variables are put as a constant. The researchers put forward this technique to effectively analyse the importance of each independent variable. The researchers were also able to interpret how the employment of machine learning varies when countries and years are kept in a constant position and at the same time the researchers try to analyses the medical decision making while keeping these independent variables constant.

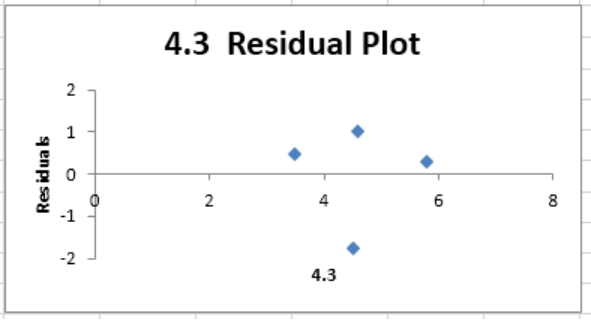

Figure 6: Regression analysis graph

DISCUSSION

Multiple regression models effectively assisted the researchers to take an effective look at the relationship between multiple variables to put forward effective prediction based on the efficiency of the variables. In this particular study, 2 dependent variables and 2 independent variables were undertaken by the researchers in this particular context. Here the researchers have taken multiple independent variables and two dependent variables effectively. The researchers mainly targeted developing countries of South America to analyses how machine learning assist in their healthcare-related decision making. The above discussion effectively commented on the efficiency of the independent variables to predict machine learning used to improve decision making in the developing economy. The high percentage rate effectively enables the researchers to comprehend that they have chosen the variables efficiently and at the same time value of the multiple R is recorded as 0.926366 which effectively demonstrates that it is a good value and the prediction the researchers are going to put forward will be very effective in this context. The above results also show that R square is recorded as 0.8581. It can be effectively stated that independent variables put forward around 85.81% variability of the dependable variables. It enables the researchers to effectively analyses variability while predicting their report as they strive for accountability and accuracy at the same time.

A similar type of approach can be witnessed in the study of another researcher. They utilized DEA techniques to measure the effectiveness of the healthcare system. However, the variables they utilized was completely different from this one. They utilized maternal mortality ratio, people infected with an immune virus and many other elements to conduct their study [16]. Even though the process was a bit complicated as the parameters used acted as an output whereas medical expenditure and hospital beds were used as the inputs. The researchers in this study also utilized hospital beds as variables to put forward studies in this particular context. Another set of researchers effectively utilized a *"robust*

estimator" to put forward an idea about the medical efficacy in the domain of Appalachia [17]. Even though the study group has utilized variables that is very easy to manipulate, it was challenging in this context. As the research was put forward by an autonomous group, they failed to utilize more suited variables in this particular context and accuracy was compromised due to that simplicity.

As per the regression analysis graph Argentina, Mexico and Brazil these three countries are benefited from the use of Machine learning and Artificial Intelligence as well. By the use of ML and AI the health care sectors improved and it increases the number of beds for patients in the healthcare sectors, a huge number of resources are allocated in the hospitality sectors, taking effective decisions on the pattern of autoimmune diseases and many others. The mortality rate and the number of newborn babies and their healthcare-related information can be easily located in countries like Brazil and for the country, Argentina same thing also happens. In the developed country, Argentina through the use of machine learning and AI the features of the spreading disease can be identified, the future study of the spread disease, the reason behind it, the proper delivery care for the particular disease, and the result of the effective remedy and many others can be easily found. A country like Nigeria is not benefited from the use of machine learning and Artificial intelligence as well. Thus according to the above graph, this country is placed in the lower part which indicates the negative aspects of ML and AI. This particular country cannot utilize machine learning, artificial intelligence, modern technology as well thus this country may not make a profit from these factors and here no noticeable improvement can be seen in these healthcare sectors. Literature associated with the effectiveness of the medical sector in develop ping economy is still very limited. The literature associated in this topic is so limited that it only put forward a limited outlook in this particular scenario. At the same time, it is important to comprehend that this micro level comprehension is not enough to reach a conclusion. However, the efforts of those scholar should not be underestimated at any cost. However, the researchers must continue to find whether the emerging countries are allocating their resources properly and at the same time they need to examine whether certain element is influencing the efficiency and affectivity of this particular scenario.

CONCLUSION

In the conclusion section, it can be stated that the report is based on the analysis of the machine learning approaches as well as the role of artificial intelligence in the healthcare sectors for making effective healthcare decisions and also emerging economy and using multiple regression for such machine learning and AI. However, the overall report briefly discussed the benefits and the challenges of Machine learning and Artificial intelligence used in the health sector in various countries, it increases the economic state of the particular nation f it uses it properly. Otherwise, it will cause a huge loss for those countries. However, the entire research paper deals with methodology, aim and objectives, literature review, data analysis, qualitative data analysis and discussion as well.

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