IMPLEMENTATION OF COVID-19 MONITORING SYSTEMS USING MACHINE LEARNING ALGORITHMS IN EDGE NETWORKS

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ABSTRACT

The Corona Virus is a new viral infection that has brought a catastrophic outbreak in the world. The pandemic has caused all the people to face a new threat. Everyone and almost every healthcare organisation are putting their best efforts to deal with and fight against the epidemic. The researchers of Artificial Intelligence are now focusing on experimenting with new ways from their expertise to build Machine Learning models for examining the Covid-19 outbreak by using worldwide collected data. The well-being of a society is now one of the important priorities of these researchers and for that, they are going to analyse this data to make everyone more cautious to deal with the pandemic situation. This article proposes to make use of Machine Learning Algorithms to recognize its day-to-day exponential behavior together with the detection and prediction of the future possibility of Coronavirus outbreak across the world. The article suggests that for such detection and prediction real-time information is needed to develop the ML algorithms. The research suggests eight ML algorithms for quick detection of suspected Covid cases. The findings of the study discusses how various researchers attempted to develop ML technologies to provide required information to infected patients and also provide help to healthcare sectors. Some researchers are also focused on developing exploratory data analysis to collect information such as the number of the Covid cases, deaths, and recoveries to prepare new strategies and activity for future threats. The research has been developed by forming secondary qualitative and quantitative data and for that graphs and table has been generated.

Keywords: Covid-19, Machine Learning, Algorithms, Edge Networks, Pandemic.

INTRODUCTION

The world has changed a lot since the outbreak of Covid-19 following the end of 2019. People are faced with new challenges every day to be more cautious. It is expected that new technologies need to be developed to monitor and detect this pandemic outbreak. In recent times, machine learning technologies are playing an important role to acknowledge and act accordingly to deal with the Covid-19 crisis. It is important to understand how ML technologies work. ML is a tool that helps in delivering hidden insights in IoS (Internet of Things) data. It enables smart devices to mimic human intelligence and assimilate huge volumes of data to recognize insights and patterns. In the healthcare system during this pandemic ML technology can gather real-time data from the consumer to recognize suspected Covid cases. It can further help those users who have already recovered by suggesting the required treatments. Ml technology further can

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recognize the nature of the Covid-19 virus from the collected data by analyzing it. The development of such technologies needs interconnected elements for a successful implementation of Covid-19 monitoring systems. The elements which will help to monitor the Covid crisis are collecting the symptom data and then uploading it, using ML algorithms in quarantine and data analysis centers, developing a data analysis centre, providing healthcare professionals who will monitor it developing and building cloud infrastructure. The paper aims to examine the ways in which the Covid-19 monitoring system can be successfully implemented using ML algorithms in edge networks. The present article has favorable results as it shows that four ML algorithms are quite effective in detecting Covid cases. This leads to the fact that during the pandemic situation such devices will help in lowering healthcare expenses.

Algorithms in Machine Learning

Recognizing potential Covid cases by using ML technology needs eight types of ML algorithms which are SVM (Support Vector Machines), K-NN (K-Nearest Neighbour), Naïve Bayes, Neural Network, ZeroR, OneR, DEcision Stump, and Decision Table 1. A thorough examination was conducted to check whether these Ml algorithms work or not (Adhikari et al., 2021b). The results show that five of these eight ML algorithms have achieved higher than 90 percent accuracy to provide error-free and efficacious recognition of suspected Covid cases. Many studies have been conducted using ML algorithms to detect and monitor Covid suspected patients and to have a better understanding in providing required treatments (Rahman & Hossain, 2021).

According to Jia 2019 using ML algorithms for predicting Covid cases is a successful experiment. Jia used three of the ML models to predict the symptoms by analyzing the collected number of infections of the Covid-19 which are the Gompertz model, logistic model, and Bertalanffy model. Other studies have been conducted to identify the number of suspected cases based on the collected statistical data. Petropoulos and Makridakis used various techniques like time-series forecasting techniques to anticipate the number of recoveries and deaths from Covid-19. Allaoui, Melliani, and Chadli attempted to search for the propagation rule of the coronavirus. They at first built a dynamic model for suspected Covid cases and then they developed a statistical model which is formed on time-series examination.

EDA METHODS

There are other studies that have been conducted to experiment with new ways of detecting and monitoring Covid cases (Yacchirema & Chura, 2021). One such study was conducted on EDA or Exploratory Data Analysis which is formed on different collected data. The aim of the study was to examine death and recovered Covid cases in Wuhan (China) and also the remaining part of the world to recognize the future threats and plan to act accordingly to deal with this virus. Stephen A. Lauer and his team conducted research that inquired about the problem which arose during the criticalness of the incubation stage for Coronavirus. They researched about 181 confirmed Covid cases and learned that the incubation stage may differ

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from five to fourteen days (Kwekha-Rashid et al., 2021). Based on this research the required planning and activities can be developed to deal with this virus.

Another researcher, Singer examined the collected data from 25 contaminated countries to build a momentary prediction of the Coronavirus outbreak. This shows that adequate work is available on EDA to examine the present tendency of pandemics. Researchers have suggested a hybrid edge network health monitoring system. The aim of the system was to build better outdoor safety. The system has two processes which are collecting the data from the user and then combining the gathered data using the internet (Alanazi et al., 2020). This system will collect safety signals and health signs from the Wearable Devices, from the environment of the user.

Darwish have suggested a CloudIoT-Heath paradigm that assimilates cloud computing with the internet of things in the heath region formed on the suited literature. Rath and Pattanayak have suggested developing a smart hospital in city areas by using IoS devices. Problems like security, safety, and on time treatment to the patients in Vehicular Ad Hoc Network were also considered (Zhang et al., 2021). Though there exists a lot of scopes to enhance and examine efficacious ML formed on prediction models to develop various strategies to act accordingly to provide the needed requirements to deal with the Coronavirus.

Automated Self-Monitoring System for Covid Patients in Malaysia

In recent times to reduce the burden of the healthcare system an automated self-monitoring CoSMoS (Covid-19 Symptom Monitoring System) has been developed to provide better treatments to Covid patients in Malaysia (HN & Jyothi, 2021). CoSMos is formed on algorithm based teleconsultation and Telegram bot. The system was formed in three stages which are:

- Building an essential formation to recognize clinical health issues and to build the clinical algorithm
- Using the agile software development process to build the testing iteration.
- Building an efficacious clinical workflow by using repeated counterfeit and role playing processes.

METHODS AND TECHNIQUES

The data collection method is a process of gathering the required information from the available sources to build the answer to the question of the research article to investigate the thesis and to develop the evaluation of the proposed research. There exist two methods to collect the required data from the available resources - secondary and primary data collection methods. In this study, secondary data has been collected to develop the research and for that qualitative and quantitative data has been gathered. Data analysis methods have been generated based on thematic analysis. Graphs, Tables, and required figure images have been generated to develop the research. Data analysis has been developed from the secondary data collection. Graphs and tables have been provided to analyse the data to enhance the research.

RESULT AND DISCUSSION

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The aforementioned research shows the ways ML technologies work in the healthcare sector to provide required treatment to infected patients. People can wear smart devices like smart bands or use mobile based applications to detect whether they are infected and get information from healthcare professions. These apps or smart devices can help them monitor their health and these devices show signs to the user if any action is needed to deal with the Covid crisis. Such wearable monitoring devices help the healthcare sector to provide advanced requirements to the users. These devices also provide information to the user whether anyone near their location is infected with the Coronavirus.

In recent times during the pandemic doctors are occupied with giving the best treatments to the patients. This again emphasises the importance of such devices for self-monitoring.

Machine learning is the branch of computer science and artificial intelligence that is being largely used in our daily life in various ways and it is playing a significant role in getting a grip on the pandemic situation of coronavirus which is having a very serious concern all around the world (Alafif et al., 2021). The virus is rapidly spreading all over the world and it has become the major cause of disruption worldwide and the spread of the COVID 19 virus includes all states, research institutions, and companies. The machine language which is fully based on artificial intelligence is helpful for the treatment and diagnosis and in this battle against the virus this language's methods, tools, performances, and data availability is summarized. In this vast healthier community, there is a survey regarding the particular overview of the methods of machine language that can be helpful in this condition and give a detailed study to avoid the pandemic situation of COVID 19 (Adhikari & Munusamy, 2021a).

The virus is attacking the respiratory system of the human body which is causing a respiratory syndrome which is very much infectious globally accounting 216 countries and their whole regions, that is why health organizations are planning for new techniques and technologies to control and track the growth and spread of the virus in a global health crisis. In this current scenario, Feraudo et al. (2020) AI is having a vast use in the world which can detect and track the growth rate and time of the coronavirus and point out the risk of the patients suffering from COVID 19. Artificial Intelligence can also predict the chance of death of any patient by analyzing the earlier data of the patient. AI can accommodate in this fight with the virus by medical assistance, information and data, recommendations, and testing individuals for controlling the virus, there are numerous sub-areas of AI which include thinking, searching, preparation and representations.

On the other hand, Adhikari et al. (2021b) there are several algorithms of AI which provide the intelligent model to cluster or identify every particular task and the subset of the Artificial intelligence is the Machine language which contains the values of the statistical structure of algorithmic modeling and the learning of a very compact quantity of knowledge for solving the problems. The main reach of Machine Language based on AI towards the virus is to absorb the research regarding the vaccine development, drug, and disease diagnosis, and this research work is published before a thorough investigation due to the vast spread of the virus and their workwill be surveyed for the quality and precision in a squint review (Hossain et al., 2020). Internationally and nationally the disease is spreading very fast and for this, the diagnosis

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contains x-ray, CT scan, medical images and some new technologies of AI development helps for better dimensions imaging instruments and smooth healthcare personnel.

Table 1
AI APPROACH IN THE EFFECT OF COVID 19 IN HEALTH IN THE US

Response	Percentage
No impact	44%
Decreased AI Focus	9%
Unsure	3%
Increased Focus of AI	44%

Source: Mukilic, 2021

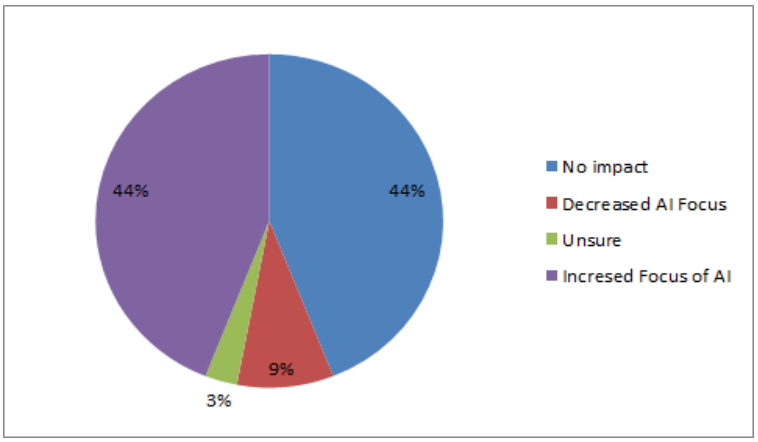

FIGURE 1
AI APPROACH IN THE EFFECT OF COVID 19 IN HEALTH IN THE US

Source: Mukilic, 2021

According to the above Figure 1, it is clearly visible that about 44 percent of the leaders in healthcare surveyed the Covid 19 report on the investment and focus of Artificial Intelligence in telehealth and give a display on the impacts on AI approach in the health care of Covid 19 in the USA (Rahman & Hossain, 2021).

Nowadays, the research regarding medical imaging is the main use to identify and diagnose by clinicians in which the x-ray of the chest and the CT scans are mainly used in the trials of the clinics and here Artificial Intelligence is playing a vital role in these clinical trials. For the monitoring, prognosis, and identification of the disease, computer technology is assisting the radiologists in making the decisions of the clinics. The feature of evaluating the patients of Covid the necessary in the diagnosis process is the CT scan and there is a growth in the research in the process of Covid 19 imaging required for the diagnosis and treatment and therefore the hospitals use the CT scan in large quantity for admissions for the rapid emergence of the patient with the Covid 19 disease for which the primary health care system is in much pressure.

Chest image detection plays an important role in the detection of the virus and estimates those who are severe patients and having symptoms of compound respiratory problems and based on these scans there is a possibility to determine the lungs that are badly compromised and

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the illness, and by this process, the medical decisions become effective for the doctors to give a quick medical solution. Jat & Singh (2020) said that the model of the Artificial Intelligence successfully diagnosed the coronavirus produced pneumonia not less than 85 percent of the time which is used in the database of only 417 patients in 4 different groups in the study across the hospitals in China. In spite of that, there is a difficulty in distinguishing the presence of Pneumonia and Covid 19 which is detected in the CT scan images by the radiologists.

For this, the AI algorithm based on the edge networks is helpful as it is the technique by which the smart devices can process any data locally by using the Machine learning algorithms by reducing the reliance on the cloud networks, as the terms refer to the processing that occurs at the local levels or device levels by the algorithm of machine learning (Kumar et al. 2021). The ingenuity and innovations help to fight in this pandemic to fight with Covid 19 bring everyone a step closer to conquer it and the Machine language and the Artificial Intelligence are playing the main role in addressing and understanding the Covid crisis. The technology of ML allows the computer to imitate human intelligence and consume data in large volumes to identify insights and patterns quickly. Organizations are rapidly applying their ML for expertise in different areas, communicating with the customers, speeding up the treatment and the research, and understanding the spread of Covid 19 disease against the struggle of Coronavirus disease.

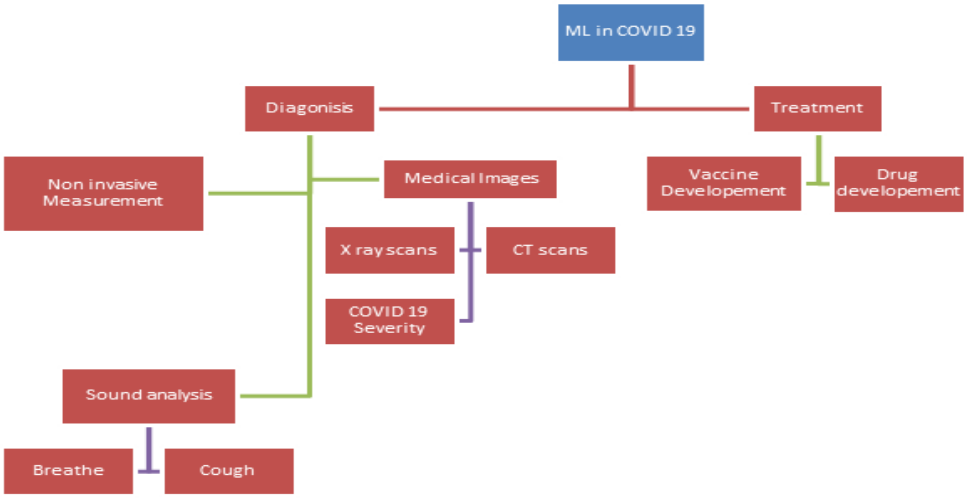

FIGURE 2
RESEARCH WORK ON THE SURVEY OF MACHINE LANGUAGE FOR DETECTING THE COVID 19 VIRUS FOR TREATMENT AND DIAGNOSIS

Source: Inspired by Tehame, 2021

According to Figure 2, for the growth and production of the Machine language, students are also involved to identify the Covid 19 patients and with the help of Artificial Intelligence, the students developed computer models that can diagnose and give the treatment of the virus through the images. The data can be discerned which will not be seen with the human naked eye and also the Covid 19 detection aid as it is the higher level of representation which is fully intelligent and developed computed models and this technology is fully created by the students of Cranfield University. The functioning of AI helps the doctors to understand the X-rays more

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efficiently and clearly with particular details with the help of the algorithms of the Machine Languages techniques and it increases the method of monitoring the progression of the disease.

The functioning of AI helps the doctors to understand the severity stages of the lungs and they are the functioning and participation of the lungs and degree of the ambivalence of the lung which is shown in the exclusive X-ray image. The overall ambivalence and degree give a score on both left and right lungs ranging from 0-6 and 0-8 respectively and the rigidity of the disease which are used to track the effectiveness of the treatment of all patients and decrease and increase of caring of the patients mainly in the ICU, which is found in the scoring basis. AI is also utilized through the development of the mobile app and evaluates the rigidness of the Covid-19.

CONCLUSION

The outbreak of Covid-19 has a heartfelt effect on every life globally and the countable death is keep on growing worldwide but the technology has pierced every life of humans into a great achievement, especially in the AI-based Machine Language, which has a full contribution in supporting the people in this difficult situation against this pandemic situation of Coronavirus. The survey explored the method of Machine Language based on Artificial Intelligence for the treatment and diagnosis of the Covid 19 patients and the methods of the AI-based Machine Language are summarised with the available machines, tools, performance, and the datasets. The survey provides detailed information regarding the existing applications and methodologies for the researchers of Machine language and with the larger health communities with the full description of the status that the data and ML boost the position of the Covid 19 virus and also more and more knowledge and study required to avoid the pandemic outbreak situation of Coronavirus. The potential guidance is presented while there was the use of the Machine Language and also the challenges came through every survey to cope up with the technology of AI-based Machine Language by the researchers and the surveyors.

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