



## **The Role of Implementing Deep Learning applications in enhancing health care services during COVID-19**

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### **ABSTRACT**

*Due to the sudden pandemic outbreak across the globe, global physicians have witnessed the necessity of implementing Deep Learning Applications to save a life more quickly and efficiently. Researchers in the research study have pointed out the implementation of deep learning applications from an effective angle. Researchers have outlined a series of relevant survey questions to gather and understand almost 60 participants' perspectives about the utilization of deep learning methods in healthcare more accurately. It has been observed that deep learning can be highly used to satisfy the growing requirements for diagnosis and medicines during the pandemic outbreak. However, by applying a positivism research philosophy, researchers have effectively conducted the primary analysis through a probability data sampling technique. From the research findings, it can be analyzed that around 60% of the participants strongly support the idea of utilizing deep learning for mitigating more error percentages while predicting necessary treatment procedures. On the other hand, around 57% of the people can be traced to highly support the implementation of deep learning approaches for enhancing overall industrial efficiency during the time of crisis. Moreover, around 25% of the participants also can be spotted who only agreed with the use of DL approaches in medical imaging for better patient-care approaches. From the survey results, it can be determined that selected participants possess a lack of proper understanding regarding the beneficial use of deep learning applications in enhancing future healthcare practices in the post-COVID situation.*

**Keywords:** Deep-learning applications, patient-care, global pandemic, healthcare survey, researchers, participants, and efficiency.

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### **INTRODUCTION**

Modern-day medical science has witnessed several benefits in patient-care facilities after utilizing machine learning and deep learning applications. Detecting critical symptoms of diseases, predicting proper treatment procedures and medical image recognition have become easier than before with the applications of deep learning approaches [1]. During the time of the global pandemic, the demand for deep learning applications has increased for evaluating the accurate medical history of patients, detecting symptoms of diseases, and necessary tests [2]. Researchers have investigated that Natural language processing through DL language offers better insights regarding relevant clinical information during the virus outbreak to determine the most accurate clinical treatments. It has been highly observed that deep learning approaches can quickly acquire COVID-affected patient insights that at once provide utter benefits to the healthcare industry while discovering major aspects across patient care.

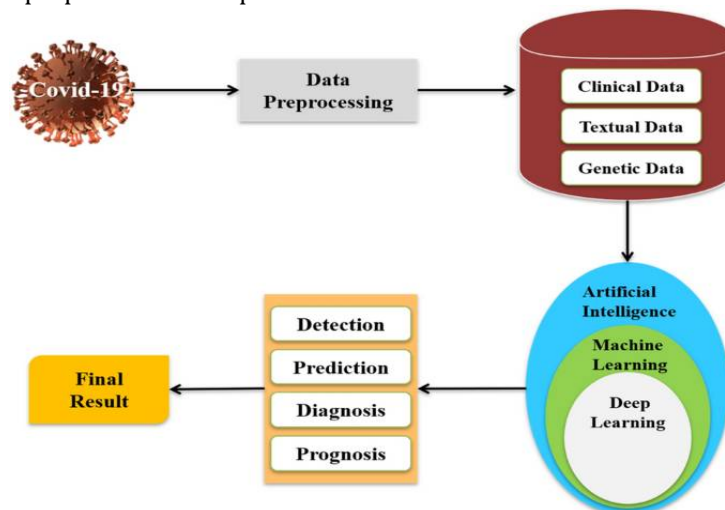
The ML-based deep learning algorithms played a major role in enhancing the overall efficiency of the UK-based healthcare industry, by almost 89.97% from 2019 to 2021 [3]. Regarding the harmful effects of the pandemic outbreak, numerous online surveys, as well as clinical resources, have been gathered from various patient-care sectors of the UK. During the past few years, the entire world has experienced a strong blow from the COVID-19 global pandemic. Surveys and reports reflected that the rapidly spreading virus at once raised the death rate to around 82.83% across entire Europe during the time [4]. Besides,

deep learning also helps in corona virus imaging from the large medical image database. Moreover, the DL applications can raise the overall efficiency of patient-care facilities during the virus outbreak that leads to an almost **80%** drop in the global economy over those years [5].

### LITERATURE REVIEW

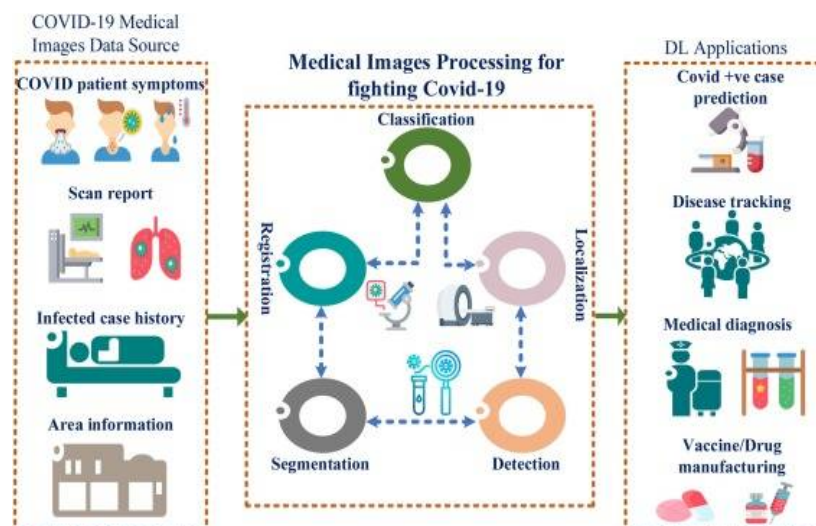
Researchers opine that only the effective applications of the DL approaches can remove around **37%** of the economic slump due to the uncertainty that has engulfed the healthcare sector [6]. Moreover, the application of AI-based machine learning approaches also helped physicians to conduct proper tests and diagnose Corona virus's effects in the host's body. Various researches conducted across the UK-based healthcare industry reflect that around **78%** of the medical practitioners strongly support the implementation of DL insights in analyzing relevant clinical information [7]. In order to undertake proper diagnosis and treatment procedures for patients' easy recovery, DL approaches provide utter assistance to global healthcare professionals.

Scientists have discovered various applications of deep learning in global healthcare practices while tracking essential medical devices and equipment. During the time of the global pandemic, physicians widely utilized deep learning applications to predict the level of patients' illness through COVID tests [8]. Apart from this, DL approaches also aided physicians to undertake proper treatment methods by keeping the patient in isolation and providing him with necessary clinical assistance [9]. The disease can spread with high contacts, so physicians use deep learning techniques while sanitizing and providing COVID-affected patients with proper medical help.



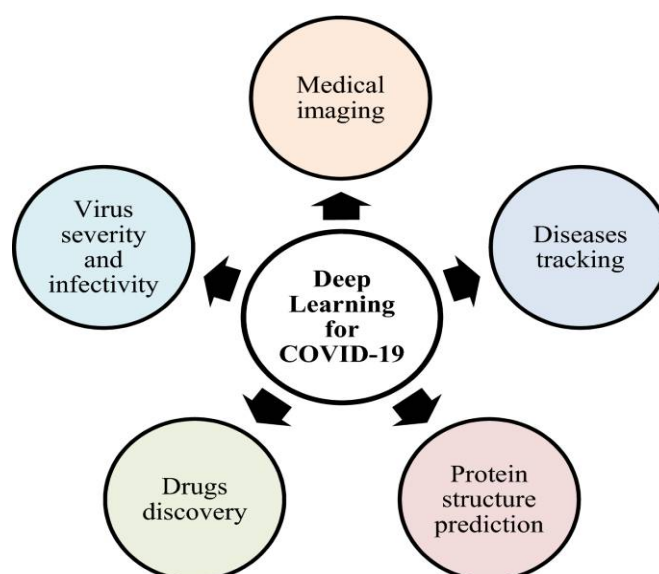
**Figure 1: Deep learning framework for detecting and diagnosing Corona virus syndromes[9]**

On the other hand, medical scientists have placed their opinions and research findings on the use of ML and DL approaches for offering people vaccines to combat the harmful virus. Based on their decade-covering research findings, researchers have come to a satisfactory point that deep learning approaches can be highly used in the vaccination and immunization process. As a result, accurate use of DL techniques can enhance the overall efficiency rate of the healthcare industry by around **91.26%** in the sustainable future [10]. With the proper use of DL algorithms, physicians can easily predict the reasons and symptoms of population health threats by determining the virus' patterns (Fig. 2). On the contrary, deep learning can also help doctors to treat the ways of mitigating the high risk of surfacing rates towards a pandemic disease progression in the future patient-care delivery.



**Figure 2: Medical image processing by using deep learning methods during the pandemic[10]**

Effective use of DL techniques at once leads the entire healthcare industry towards a more accurate predictive analysis that can mitigate the death rate by **41%** more in the upcoming years [11]. The growing implementations of DL learning during the years **2019-2021**, aided healthcare practitioners to recover **52.83%** of the pandemic loss more efficiently [12]. With the growing cases of Corona, physicians feel a need to conduct more innovation, development, and improvement in the application procedures of deep learning in the recent era (Fig. 3). During the detection and diagnosis of COVID-19 disease syndromes, **63.85%** of scientists and doctors prefer the use of relevant wearable clinical technology incorporated with AI systems [13]. From a remote place and with the help of neural networks across the vast Internet, efficient healthcare practices can be easily regulated by DL algorithms.



**Figure 3: Importance of applying deep learning applications for COVID-19[13]**

However, to serve patients in a better way during the global crisis, deep learning offers physicians the acquisition of meaningful as well as long-lasting language-based learning [14]. Apart from this, deep learning also enhances critical disease diagnosis operations at cheaper expenses during the global pandemic [15]. As a result, researchers show genuine interest to examine the role of DL applications in treating Corona cases more precisely besides offering more personalized patient care during the current era.

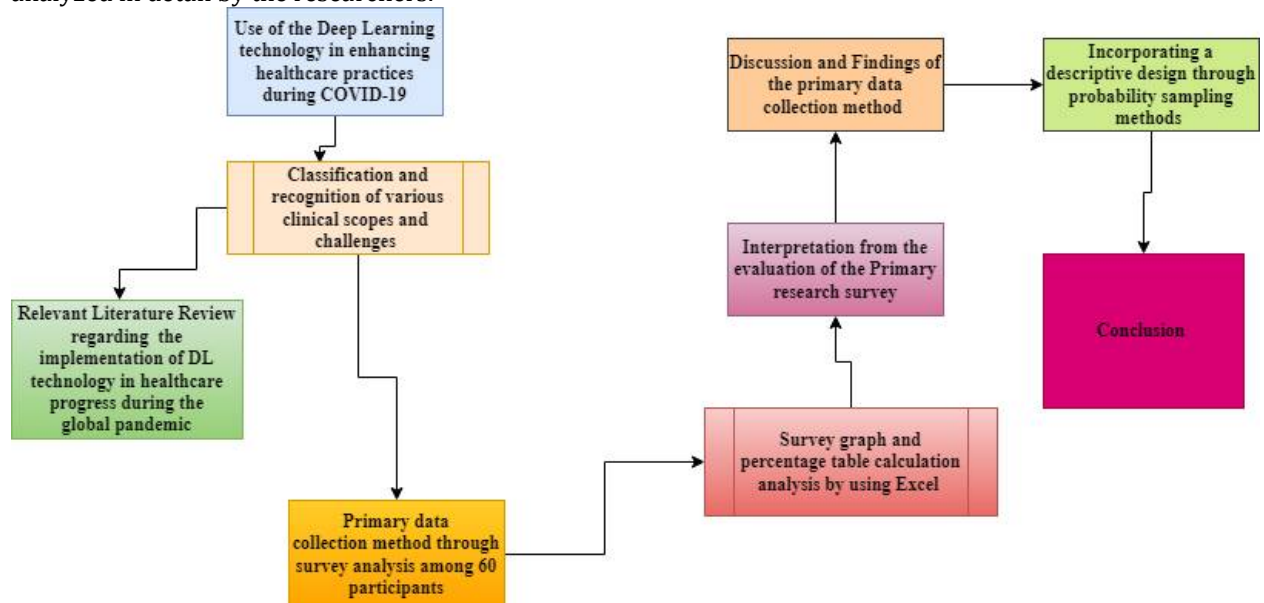
## MATERIAL AND METHODS

It has been also observed that proper use of deep learning has escalated the entire economic growth by **47%** much bigger than the COVID-years' revenue collection [16]. Researchers in this research paper thus

utilized various effective research methodological approaches to determine the role played by DL in enhancing patient care during the pandemic period. Researchers while scrutinizing the research study have undertaken a Primary Quantitative method for relevant medical collection for understanding the current research topic more clearly.

Researchers have applied quantitative methods for both collecting and analyzing current medical records to get an idea about the harmful impacts of the Corona virus [17]. In order to investigate more on the usefulness of using DL approaches during pandemic times, researchers have framed relevant survey questions by incorporating a positivism research philosophy in the research paper. They have also applied a deductive research method while gathering authentic and valid clinical data. On the other hand, during carrying out relevant research on the use of DL in healthcare, researchers have also pointed out the significance of incorporating a descriptive research design to collect and evaluate necessary patient-care records related to the research topic more accurately. However, the primary data involvement would be highly beneficial for conducting the research by reducing relevant challenges faced by the researchers during the global pandemic crisis.

After collecting relevant opinions from physicians, clinical practitioners, patient-care professionals, healthcare staff, and hospital nurses, researchers focused much on comprehending the consequences of implementing DL for acquiring more proper results. Researchers have focused much on collecting relevant responses from around 70 participants through survey analysis. However, around 10 participants did not help researchers during the conduction of the research study regarding the role of the DL approach for increasing better healthcare deliveries through virtual mediums. Researchers have outlined three important survey questions while collecting virtual binary responses through options from around 60 participants. Besides, the detailed survey analysis at once involves the accuracy as well as the relevance connection with the use of DL approaches in healthcare during the pandemic outbreak. Researchers have performed probability methods during gathering sampling. However, all opinions of the participants have been gathered and analyzed through undertaking a random selection of people directly linked with the topic of the research. After collecting their responses, all the survey outcomes have been analyzed in detail by the researchers.



**Figure 4: Flowchart diagram of the research**

## RESULTS

Researchers have focused on acquiring relevant medical records by applying probability techniques while comprehending the necessities of analyzing participants' responses from an effective perspective. Apart from the survey questionnaires, researchers have framed two additional research questions for evaluating all the survey outcomes more efficiently. The important questions created by the researchers regarding the particular topic are-

- What are the benefits and scopes offered by deep learning approaches towards increasing the efficiency rate of better healthcare services during the global pandemic?

- How can deep learning applications enhance the accuracy detecting rate in healthcare by mitigating errors and risks in the sustainable future?

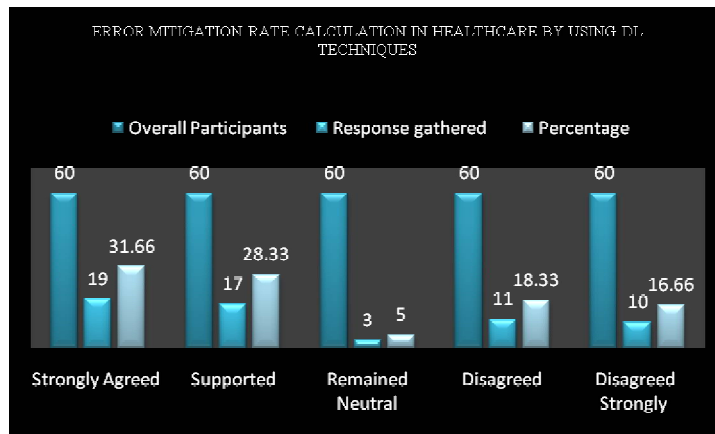
#### Survey-related questions

**Q1.** Do you think that deep learning applications can reduce error percentage rates during predicting treatment analysis regarding Corona virus detection across the healthcare industry?

**TABLE I. ERROR MITIGATION RATE CALCULATION IN HEALTHCARE BY USING DL TECHNIQUES**

(SOURCE: CREATED BY THE RESEARCHERS)

Participants' choice	Overall Participants	Response gathered	Percentage
Strongly Agreed	60	19	31.66
Supported	60	17	28.33
Remained Neutral	60	3	5
Disagreed	60	11	18.33
Disagreed Strongly	60	10	16.66



**Figure 5: Error mitigation rate calculation in efficient healthcare practices during the pandemic by using DL approaches**

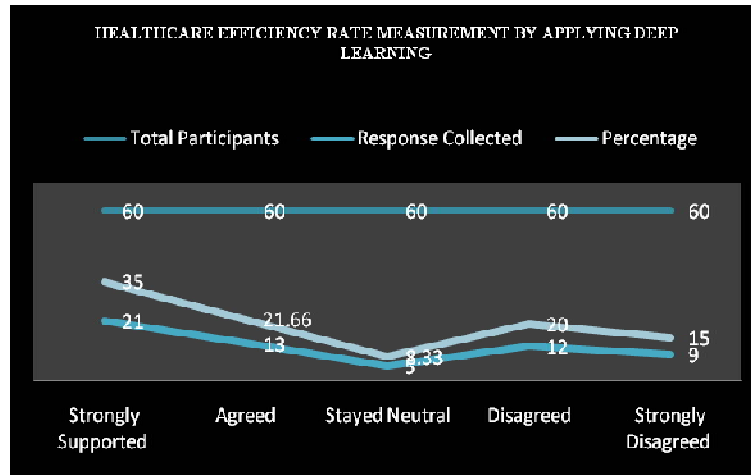
Researchers have analyzed the first survey question by evaluating all the collected responses from the **60 participants**. From the above percentage table, it can be highly evident that around **31.66%** of the people have strongly supported the validity of the question. Besides, around **28.33%** of the participants positively supported this approach. However, only **5%** of the people remained neutral regarding the error mitigation rate measurement due to deep learning approaches in healthcare. During the time of the global pandemic, it has been found that around **18.33%** of the participants denied the idea of using DL approaches in detecting Corona virus by eliminating the conventional process. On the contrary, researchers have traced around **16.66%** of people who strongly disagreed with the relevancy of the first survey question. Relevant calculation gaps and percentage differences have been highly evaluated from the calculation table.

**Q2.** Do you support that accurate application of deep learning can enhance the overall efficiency of healthcare towards improved patient care during the pandemic outbreak?

**TABLE II. HEALTHCARE EFFICIENCY RATE MEASUREMENT BY APPLYING DEEP LEARNING**

Options of the Participants	Total Participants	Response Collected	Percentage
Strongly Supported	60	21	35
Agreed	60	13	21.66
Stayed Neutral	60	5	8.33
Disagreed	60	12	20
Strongly Disagreed	60	9	15





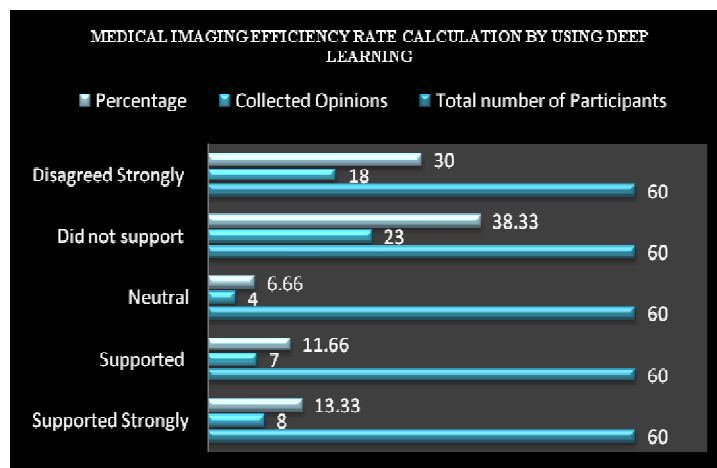
**Figure 6: Healthcare efficiency rate measurement in healthcare during the COVID outbreak by applying deep learning techniques**

In order to discuss the role of deep learning in increasing the overall effectiveness of the healthcare sectors, researchers have focused more on analyzing the second survey question. After analyzing participants' responses regarding the particular survey question, researchers have pointed out that around **35%** of the people strongly support the use of DL technology in mitigating corona virus-related death risks. On the other hand, among *60 potential participants*, around **21.66%** of the people supported the idea of the second survey topic. However, from the table, it can be highlighted that only **8.33%** of the participants did not provide any positive response regarding the use of DL techniques for better patient-care approaches. Apart from this, researchers have also spotted almost **20%** of the people who disagreed with the relevancy of the second question. Further, among the participants, almost **15%** of people can be identified who strongly rejected the validity of the second survey question related to the research topic. All the major percentage gaps can be minutely analyzed from the percentage calculation table to understand the importance of applying deep learning approaches in healthcare aspects.

**Q3.** Will proper deep learning implementation help in better corona virus disease imaging from large datasets for more improved patient-care service delivery?

**TABLE III. MEDICAL IMAGING EFFICIENCY RATE CALCULATION BY USING DEEP LEARNING**

Participants' options	Total number of Participants	Collected Opinions	Percentage
<b>Supported Strongly</b>	60	8	13.33
<b>Supported</b>	60	7	11.66
<b>Neutral</b>	60	4	6.66
<b>Did not support</b>	60	23	38.33
<b>Disagreed Strongly</b>	60	18	30

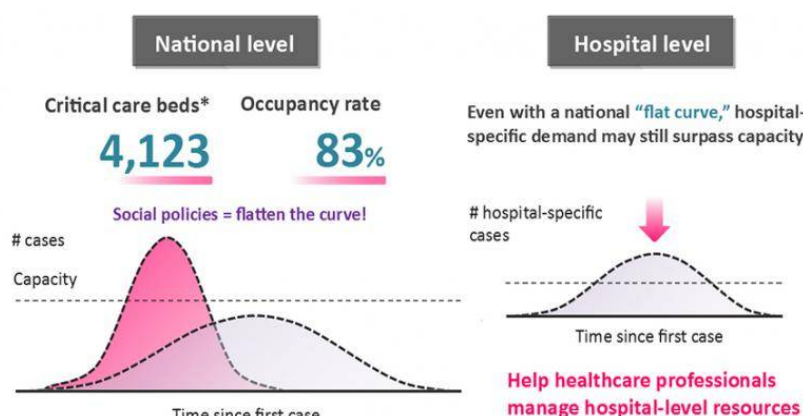


**Figure 7: Medical imaging rate measurement during the pandemic outbreak by using DL methods**

While analyzing the third survey question, researchers have experienced a sudden shift in the opinions of participants from a positive angle to a negative point. In order to investigate the role of DL approaches in combating COVID syndromes, researchers have collected and evaluated opinions from **60 participants** regarding the efficient conduction of clinical images. From the above analysis, it can be stated that around **13.33%** of the participants have strongly supported the idea of using DL approaches for more accurate medical imaging. Besides, almost **11.66%** of the people can be highlighted from the participants who positively agree with the third relevant survey question. However, researchers have pointed out only **6.66%** of the participants did not provide any responses positively or negatively related to the research topic. On the contrary, researchers have spotted almost **38.33%** of the people who provided negative responses regarding the relevance of the third research question. Moreover, around **30%** of the participants strongly denied the usefulness of the third survey topic in healthcare sectors. From the above growth and percentage calculation table, all the key differences can be highly observed to a great extent.

## DISCUSSION

From the survey findings, it can be analyzed that researchers have successfully analyzed all the perspectives of almost 60 potential participants for understanding the research topic more clearly. After evaluating all the 3 survey results, researchers examined that participants have different changing opinions regarding the scopes offered by deep learning approaches. However, during the pandemic outbreak, all the responses regarding healthcare practices have been conducted effectively through online and contactless mediums. The result from the first question related to the survey at once reflects that almost 60% of the participants agreed with the usefulness of the DL application for more error reduction practices and obtaining more accurate results from a positive approach. With the effective solutions of Deep learning Applications, healthcare professionals can effectively deliver personalized facilities of patient care. Moreover, researchers have also determined that with the growing utilization of deep learning algorithms in healthcare, the overall growth is expected to be around 98% within the year 2026 [18].



**Figure 8: Graph reflecting the use of deep learning approaches during the global pandemic for better healthcare supports[18]**

On the other hand, from the analysis of the second survey question, researchers can highly identify the causes of applying deep learning. However, in the diagnosis of COVID-related diseases, DL approaches at once can increase the efficiency of the entire industry by almost **51.26%** in the sustainable future. It has been analyzed from the second survey outcome that around **57%** of the people have supported the idea of utilizing deep learning for better healthcare conduction in the post-COVID future. Scientists have identified that to eradicate life threats and infection risks due to the Corona virus, DL applications can at once be highly beneficial for life-saving clinical practices [19]. Towards enhancing more accurate and beneficial healthcare services across the globe, deep learning benefits at once inspire scientists to investigate more on satisfying the growing demands for medicines.

**TABLE IV: ANALYSIS OF THE SURVEY OUTCOMES REGARDING THE APPLICATIONS OF DEEP LEARNING IN PATIENT-CARE PRACTICES**

<i>Topic Discussed</i>	<i>Supported</i>	<i>Neutral</i>	<i>Disagreed</i>
(a) Deep learning is essential for mitigating error percentage while undertaking relevant healthcare decisions during COVID-19.	60%	13%	27%
(b) Relevant use of deep learning can at once increase the overall efficiency of healthcare practices.	57%	9%	34%
(c) During the time of the pandemic outbreak, deep learning has helped physicians in detecting proper medical imaging of coronavirus disease.	25%	15%	60%

From the third survey question analysis, researchers can at once conclude that during the outbreak of the global pandemic, deep learning assisted healthcare practices to some extent. As people have no accurate understanding of the technical implications of deep learning in medical image processing, a large shift from positivity can be seen while collecting participants' opinions. After analyzing the validity of the third survey question, researchers have pointed out that only **25%** of the people have shared their positive responses along with the third survey opinion [20]. The deep learning approaches in healthcare practices can help medical professionals to evaluate big medical data sets consisting of patients' history and essential data records. While treating the corona virus syndromes, doctors widely used deep learning medical imaging techniques to pull together the affected person's insights [21]. Deep learning algorithms at once enable healthcare professionals to offer personalized healthcare facilities to global patients by examining a patient's clinical history and records [22]. With the implementation of the deep learning approaches, detecting corona virus symptoms has been more efficient these days. Moreover, the entire evaluation of survey results shows the significant applications of deep learning in increasing more sustainable patient-care practices during the global pandemic outbreak.

## CONCLUSION

Nowadays, machine learning, transfer learning, and deep learning approaches are being broadly used in global healthcare sectors by medical scientists. Previously, physicians faced a lot of challenges while detecting diseases and conventionally predicting necessary treatment procedures. However, with the advent of various AI-based technological approaches, the healthcare industry has experienced huge progress while monitoring patients across the globe. People started being widely affected by the attack of Coronavirus and as a result, the global healthcare industry was adversely affected during the year **2019-21**. Scientists and physicians have investigated minutely the medical uses of DL applications while detecting proper COVID syndromes or predicting necessary diagnostic procedures [23]. Researchers have identified that with the proper utilization of deep learning algorithms, the overall healthcare efficiency could be amplified much better during the period of the global pandemic. Maintaining proper AI-based deep learning approaches can help physicians to conduct improved patient-care facilities in the sustainable future. However, to combat the global disease, researchers have witnessed the need for applying deep learning language in healthcare practices. However, researchers have gathered and interpreted all the outcomes of COVID-related clinical records through primary sources. Researchers by presenting three relevant survey questions to the participants have asked their opinions about COVID-related medical practices. Survey researchers have submerged themselves into evaluating all the responses collected from the participants for determining accurate results and incorporating them into the study.

## REFERENCES

1. A. Jain, A. K. Yadav & Y. Shrivastava (2019), "modelling and optimization of different quality characteristics in electric discharge drilling of titanium alloy sheet" material today proceedings, 21, 1680-1684



2. A. Jain, A. k. pandey, (2019), "Modeling and optimizing of different quality characteristics in electrical discharge drilling of titanium alloy (grade-5) sheet" material today proceedings, 18, 182-191
3. A. Jain, A. k. Pandey, (2019), "multiple quality optimizations in electrical discharge drilling of mild steel sheet" material today proceedings, 8, 7252-7261
4. V. Panwar, D. K. Sharma, K.V.P.kumar, A. Jain & C. Thakar, (2021), "Experimental investigations and optimization of surface roughness in turning of en 36 alloy steel using response surface methodology and genetic algorithm" materials today: proceedings, <https://doi.org/10.1016/j.matpr.2021.03.642>
5. Rahman, M.A., Hossain, M.S., Alrajeh, N.A. and Guizani, N., (2020). B5G and explainable deep learning assisted healthcare vertical at the edge: COVID-19 perspective. IEEE Network, 34(4), pp.98-105.
6. Rahman, M.A., Hossain, M.S., Alrajeh, N.A. and Gupta, B.B., (2021). A multimodal, multimedia point-of-care deep learning framework for COVID-19 diagnosis. ACM Transactions on Multimedia Computing Communications and Applications, 17(1s), pp.1-24.
7. Rahman, A., Hossain, M.S., Alrajeh, N.A. and Alsolami, F., (2020). Adversarial examples—Security threats to COVID-19 deep learning systems in medical IoT devices. IEEE Internet of Things Journal, 8(12), pp.9603-9610.
8. Sedik, A., Iliyasa, A.M., El-Rahiem, A., Abdel Samea, M.E., Abdel-Raheem, A., Hammad, M., Peng, J., El-Samie, A., Fathi, E., El-Latif, A. and Ahmed, A., (2020). Deploying machine and deep learning models for efficient data-augmented detection of COVID-19 infections. Viruses, 12(7), p.769.
9. Chintalapudi, N., Battineni, G. and Amenta, F., (2021). Sentimental analysis of COVID-19 tweets using deep learning models. Infectious Disease Reports, 13(2), pp.329-339.
10. Jamshidi, M., Lalbakhsh, A., Talla, J., Peroutka, Z., Hadjilooei, F., Lalbakhsh, P., Jamshidi, M., La Spada, L., Mirmozafari, M., Dehghani, M. and Sabet, A., (2020). Artificial intelligence and COVID-19: deep learning approaches for diagnosis and treatment. IEEE Access, 8, pp.109581-109595.
11. Shankar, K., Perumal, E., Elhoseny, M., Taher, F., Gupta, B.B. and El-Latif, A.A.A., (2021). Synergic Deep Learning for Smart Health Diagnosis of COVID-19 for Connected Living and Smart Cities. ACM Transactions on Internet Technology (TOIT), 22(3), pp.1-14.
12. Vargo, D., Zhu, L., Benwell, B. and Yan, Z., (2021). Digital technology use during COVID-19 pandemic: A rapid review. Human Behavior and Emerging Technologies, 3(1), pp.13-24.
13. plos.org, (2022): Identification of high-risk Covid-19 affected patients by using DL approach, available at <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0257234> [Accessed on 15th February 2022]
14. nih.gov, (2022): Deep learning approaches for Covid-19 patients, available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7797891/> [Accessed on 15th February 2022]
15. Chaudhary, Y., Mehta, M., Sharma, R., Gupta, D., Khanna, A. and Rodrigues, J.J., (2021), March. Efficient-CovidNet: deep learning based COVID-19 detection from chest x-ray images. In 2020 IEEE international conference on e-health networking, application & services (HEALTHCOM) (pp. 1-6). IEEE.
16. Alafif, T., Tehame, A.M., Bajaba, S., Barnawi, A. and Zia, S., (2021). Machine and deep learning towards COVID-19 diagnosis and treatment: survey, challenges, and future directions. International journal of environmental research and public health, 18(3), p.1117.
17. Sevi, M. and Aydin, İ., (2020), October. COVID-19 detection using deep learning methods. In 2020 International conference on data analytics for business and industry: way towards a sustainable economy (ICDABI) (pp. 1-6). IEEE.
18. Al-Laith, A. and Alenezi, M., (2021). Monitoring people's emotions and symptoms from Arabic tweets during the COVID-19 pandemic. Information, 12(2), p.86.
19. Alwashmi, M.F., (2020). The use of digital health in the detection and management of COVID-19. International Journal of Environmental Research and Public Health, 17(8), p.2906.
20. Ahsan, M., Based, M., Haider, J. and Kowalski, M., 2021. COVID-19 detection from chest X-ray images using feature fusion and deep learning. Sensors, 21(4), p.1480.
21. Panwar, D.K. Sharma, K.V.P.Kumar, A. Jain & C. Thakar, (2021), "Experimental Investigations And Optimization Of Surface Roughness In Turning Of EN 36 Alloy Steel Using Response Surface Methodology And Genetic Algorithm" Materials Today: Proceedings, <https://doi.org/10.1016/j.matpr.2021.03.642>
22. A. Jain, C. S. Kumar, Y. Shrivastava, (2021), "Fabrication and Machining of Metal Matrix Composite Using Electric Discharge Machining: A Short Review" Evergreen, 8 (4), pp.740-749
23. A. Jain, C. S. Kumar, Y. Shrivastava, (2021), "Fabrication and Machining of Fiber Matrix Composite through Electric Discharge Machining: A short review" Material Today Proceedings. <https://doi.org/10.1016/j.matpr.2021.07.288>

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