European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 10, Issue 01, 2023

IoT Research On Healthcare Data Aimed At Preventing And Treating Oncology-Related Illnesses

Dr.Selvia arokiya mary amalanathan MSN,CRM,MD(AM) (primary author)

Dr.Emaan Elsayed Hussein Mohammad (co author)

Associate professor , College of medical sciences University of Bisha

Abstract — ***Let's start with IoT, which enables developers to boost prediction even before they have all the data they need. Now that we have access to so much data, we can train machines to make more accurate predictions about how they will operate and when they will need repairs. According to the WHO, cancer is the second biggest cause of death throughout the globe. Those afflicted by cancer are more vulnerable to passing away during the present pandemic. A round-the-clock monitoring system is essential since the disease's prevalence rises steadily over time. The IoT may be used as a cancer monitoring system, allowing for the detection of early cancer indications, the ongoing monitoring of people who have cancer, and the testing of those who have been deemed cancer-free after treatment. This work lays out a comprehensive strategy for a disease monitoring and control system based on the Internet of Things, which might form the backbone of cancer diagnosis and management in far-flung locations.***

Keywords—Deep learning, IoT, Medical, Healthcare, Surveillance

I. INTRODUCTION

Since machine learning can improve patient care while decreasing costs and boosting efficiency, it is of main interest to healthcare organizations of all sizes, kinds, and areas of specialty. Developing completely autonomous agents requires enhancing ways for intelligently managing the now-ubiquitous content infrastructures, which is especially important given the high value of data. An approach that can help get us there is learning more about how people interact with algorithms. Simply said, deep learning is a kind of machine learning who addresses problems that traditional ML approaches cannot. Numerous researchers have shown the expanding significance of machine learning (ML) within the healthcare sector. Machine learning is already being used in areas such as electroencephalogram or tumor diagnosis. It may be challenging to monitor vitals such as heart rate and blood sugar levels, even for those who have access to medical care. Common methods for monitoring cardiac rhythm in hospitals include patients being physically restrained by their hooked connections at all times. Intermittent monitoring of heart rate is vulnerable to sudden changes in other vitals. [1]

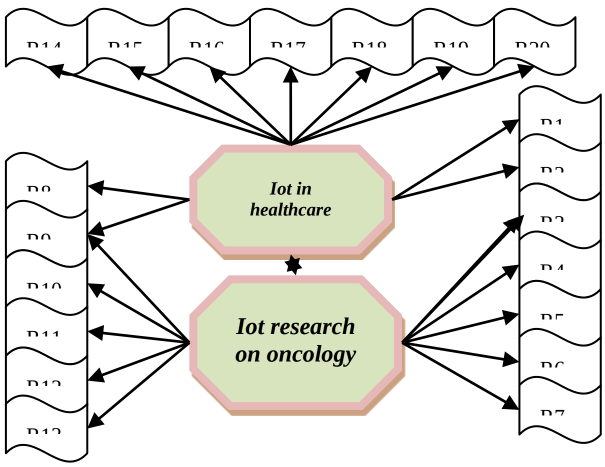

Figure 1. SEM of IoT research on healthcare data aimed at preventing and treating oncology-related illnesses

II. OBJECTIVE

The research aimed to fulfill the following objectives:

- To describe the internet of things;
- To list deep learning's role in cancer detection;
- To examine internet of things research on health care data.
- Examine the linked future of the internet of things in the diagnosis.
- Examine the obstacles in the internet of things research for cancer control.
- Examine the significance of IoT in healthcare, including its different advantages and processes for cancer detection
- To research individualized medical treatment using internet of things applications to control cancer sickness.
- To examine how this system operates and how an organization manages it.

ISSN 2515-8260 Volume 10, Issue 01, 2023

III. METHODOLOGY

Recently, the internet of things or learning methodologies has attracted great interest. Businesses including retail, finance, travel, manufacturing and even healthcare are being transformed by these technologies. The healthcare sector is one of the most significant users of this technology. Even though health is an issue, experts in the medical field are continuously looking for creative methods to make use of emerging technology and achieve substantial outcomes. In addition to a Patients Side Unit (PSU) wristband prototype, an implementation framework has also been provided for the suggested system as part of this research. The suggested strategy has the potential to be implemented, which would result in fewer trips to the hospital, which are both costly and time-consuming while preserving the same level of quality in the medical treatment that is delivered from home.

IV. INTERNET OF THINGS

One of the most rapidly expanding subsets of the Internet of Things industry is healthcare devices. The medical nanotechnology market, or the "Iota of Medical Things," is expanding in significance (IoT)

Understanding what the Internet of Things (IoT) means for the world as a whole as well as how medical IoT devices need to be monitored and controlled requires having a solid foundation in the many different possible uses of IoT devices in the healthcare industry. IoT sensors are utilized to gather data such as a patient's heart rate and temperature. While the most common use of Internet of Things technology in medicine is remote medical surveillance, this is not the only use of IoT in this industry. [5] A device of this kind connected to the internet gathers patient information and sends it to a computing device that both patients and physicians may utilize. Data may be analyzed by algorithms, which can also generate alarms and recommend possible courses of action. For example, if a sensor connected to the Internet of Things (IoT) determines that a patient's heartbeat is dangerously low, the sensor may sound an alarm, which would then encourage medical professionals to take action. [2]

Internet of Things devices provides additional diagnostic and self-monitoring options for healthcare professionals and people alike. Therefore, the variety of pervasive IoT devices offers both advantages and disadvantages for both healthcare providers and their patients.

IoT devices are widely used in healthcare, with remote patient monitoring being the most popular use. Internet-of-Things devices may collect health data from people who aren't physically present at a healthcare facility, such as heart rate, pulse rate, thermometer, and more, eliminating the need for people to go to physicians or collect it themselves. [3]

Over 30 million people in the United States now suffer from diabetes, and some of them have had a hard time keeping track of their blood sugar levels for years. Keeping track of a patient's blood sugar levels requires constant effort and meticulous record-keeping, and the results are only accurate for the moment they are measured. If there is a significant shift in levels, the procedures may not be sufficient to detect a problem. [4]

Internet-of-Things devices may aid in resolving these problems by providing patients with 24/7 automated glucose monitoring. Reducing the need for manual record-keeping and providing early warning of abnormal glucose levels, glucose monitoring devices are becoming more used

.

Designing an electronic system that is: a. small enough to monitor continually without upsetting patients; and b. doesn't waste far much power that it has to be recharged occasionally is a challenge when developing a monitoring device.

These were not insurmountable obstacles, and solutions to them might revolutionize how patients handle glucose monitoring [5].

Table 1 displays healthcare sector diagnostic techniques aided by IoT.:-

Diagnostic Technique	Govt. n (%)	Private (%)
RDT	652(71)	350(78)
RDT and microscopy	28(5)	99(30)
Microscopy and unknown	35(<1)	9(3)

V. IOT STUDY ON HEALTHCARE INFORMATION

In all, more than 14 million individuals are diagnosed with cancer each year, and it is expected that this figure will increase to somewhere about 3.7 million by the year 2030. The long-term implications of a sickness like this are dreadful for the individuals who are affected by it, expensive for the healthcare practitioners who treat them, and a significant strain on the economy of the countries that are afflicted. Despite the disastrous effects that cancer has had on our society, It has recently been observed that as a consequence of the numerous advancements that have been made in the management of cancer, the typical length of life of people with cancer has greatly risen. The majority of people who are diagnosed with cancer require surveillance at all times during the day & night, in addition to routine oncology treatment & care from trained professionals. Given the existing arrangement of the medical system, cancer patients are not provided with enough round-the-clock reporting assistance. [6]

Over the last several decades, cancer research has progressed steadily. To identify cancers in their early stages, before any symptoms appeared, researchers used several techniques, including screenings. They have also created novel approaches for the early prediction of cancer treatment outcomes. Many volumes of medical research have been conducted and made accessible to medical academic researchers as a direct result of recent technological advances in the field of medicine. [10] Predicting the course of a disease is one of the most fascinating and challenging tasks facing physicians today. Consequently, machine learning (ML) technologies are increasingly being used in the research diagnostic process. To effectively predict the future effects of a cancer type, it is necessary to extract patterns from complex data and determine the relationships between them. [7]

Educating ourselves more about how people interact with computer programs. Although our understanding of how algorithms affect people in clinical practice is still improving, it has come a long way in recent years. The computer-aided diagnosis was shown to significantly enhance outcomes when a desktop diagnosis for mammography was approved by the FDA in the late 1990s. Alert fatigue has been connected to being constantly warned and alerted. Humans aided by AI fared better than humans without assistance in a trial of diabetic retinopathy screening. Methods for improving the clarity and understanding of medical data and encouraging more active participation in the clinician's work. Our understanding of the dynamic relationship between healthcare providers and human-centered AI technologies in the treatment scenario must be expanded. [8]

VI. THE FUTURE OF THE INTERNET OF THINGS IN CANCER DIAGNOSTIC METHODS

Machine learning has been called into question due to claims that its cutting-edge technology "has immense power to compromise patient choice, safety, and privacy." Inaccurate clinical recommendations might result from biased data used to train algorithms. [9]

Current treatment options for the rising number of people diagnosed with cancer are expensive, time-consuming, and include frequent visits to specialized medical institutions, such as hospitalizations. These kinds of assets are also notoriously scarce and hard to acquire promptly. Therefore, there is a need for systems that can continuously detect tumors and cure them without breaking the bank. Two important problems in the treatment of cancer patients are late diagnosis due to misinterpretation of symptoms and misdiagnosis all together. Due to the similarities between the behavior of cancer symptoms and that of other symptoms, such as congestion and fever, cancer patients' symptoms are often dismissed as being unimportant. [10]

Misdiagnosis happens commonly in the first stages of cancer cell growth because Individuals are not informed of the existence of this thing, so as a result, they do not go to healthcare facilities for screening mammography. In addition, many professionals in the health field acknowledge that it is very difficult to identify cancer individuals in the initial phases of the disease due to the duplication of signs. There are often limits to how much information doctors can get from a single office visit. However, it is widely acknowledged that early cancer detection is crucial since the illness is more curable if caught early.

In light of the importance of individualized care and the expanding use of machine learning algorithms in these areas, we provide a survey of studies that employ these methods in diagnostic imaging and prognosis. Cancer patients may benefit from the information gleaned from this research when making treatment decisions since the prognostic and predictive features examined here can be utilized independently of any one treatment modality. [11] Further, we talk about the many ML approaches, the kinds of data they employ, the present performance of each scheme, and the pros and cons of each.

Several kinds of studies based on different techniques that may allow for early cancer methods for diagnosis or prediction that are connected with the profiling as well as circulation minas have been reported in publications that have been subjected to peer assessment; they are must-reads for cancer identification and detection. These methods have limited sensitivity and difficulties distinguishing benign from malignant tumors when used for early-stage screening. [12] Cancer categorization and prediction, using factors such as transcriptome signatures, is explored in. These researches examine the potential and pitfalls of microarrays for predicting the prognosis of tumors. Little progress is being made in the practical application of gene signature, despite its promise to dramatically enhance our capacity to estimate the prognosis of cancer patients. However, more extensive validation and the collection of bigger data sets are required before gene expression monitoring may be employed in clinical practice.

VII. OBSTACLES IN ONCOLOGICAL CANCER CONTROL RESEARCH IN THE AGE OF THE INTERNET OF THINGS

Several randomized controlled trials (RCTs) using artificial intelligence methods have been carried out so far. For instance, a randomized controlled trial (RCT) discovered a substantial decrease in the ratio of visibly deficient patients enduring esophagogastroduodenoscopy, as well as an automation process that was employed to identify early life vision problems demonstrates outstanding outcomes in a tiny cohort research albeit less accurate achievement comparison to veteran healthcare professionals in an RCT that was designed to diagnose the condition. Both of these findings were published in medical journals. With the help of this approach, the magnitude of the responder variables might well be calculated for every repetition of the collecting process. The process of clustering data items into multiple groups based on their similar properties is a common unsupervised activity. The results of this method may be used to categorize new people into one of the existing sets based on shared traits. [13]

The System's Architectural Flavor The proposed architecture for the system is three-fold. As a result of the layered design, we can learn more about the underlying components of the computer system at a higher degree of abstraction. The academic literature often refers to these three layers as the "Perceptual Layer," the "Internet Protocol Layer," and the "Application Layer." The Customer Layer, the System Having Multiple, and the Medical Layer was the standard naming conventions used in our system. This four-part architecture was approved due to its appealing features, such as scalability, connectivity, interoperability, privacy, and visibility. [14] Constraints on memory, processing networks, and energy usage are common topics of discussion when discussing the Internet of Things. The creation of an IoT-based system faces several important obstacles that must not be disregarded. This is why most processing now occurs on the server, which can do far more complex tasks than any IoT device. Using a multi-layer architecture, we can manage the isolation of these issues.

To this point, there have been just a handful of RCTs of intelligent devices on a more limited level. One randomized controlled trial demonstrated a substantial reduction in the perceptually impaired component of esophagogastroduodenoscopy. Some other randomized controlled trials demonstrated that a sound neural network enhanced speech recognition. A third randomized controlled trial demonstrated that a method was using to detect adolescent cataracts had introduced an advantage in a tiny population but performed less precisely than high-ranking healthcare experts in a diagnosing randomized controlled trial. [15]

VIII. WHY IOT IS IMPORTANT IN HEALTHCARE AND THE MANY WAYS IT CAN AID IN CANCER DIAGNOSIS

To illustrate a Public healthcare unit, we shall assume a hospital environment for this part. The cancer patient's information is accessible through the hospital's private cloud system, which is linked to the facility's centralized node and switching. The centralized cloud server sends packet data to the central switch, which in turn sends it onto the decentralized cloud platform. Important and unique patient data and information are kept in the private cloud. Additionally, the hospital has its private cloud server which processes all of the institution's critical data. [16]

Integrating a network of cloud services has the potential to drastically reduce the time needed to gather and analyze vital data. Expert medical professionals, such as oncologists, may review hospitalized patient data for decision-making purposes. Medical professionals, such as oncologists, are equipped with mobile phones, desktop computers, and portable tablets for use in cancer patient monitoring. Together, these tools may carry out orders that monitor a cancer patient's present and past readings and levels, as well as the effectiveness of their therapy. The Skilled Worker needs to get the cancer monitoring system app through web applications, i.e. in development or application, as such a platform allows for simple building.

It is possible to leverage web services as containers and drastically save development time by reworking some functionalities.

Web services are advantageous since they are inexpensive and can easily accommodate unstructured data. Using the Wi-Fi connections available inside the healthcare setting, application developers' computers may talk to the hospital's main switch and get the necessary data from the corporate cloud. [17] The medical staff may monitor cancer patients continuously and be warned of any impending risk using this strategy.

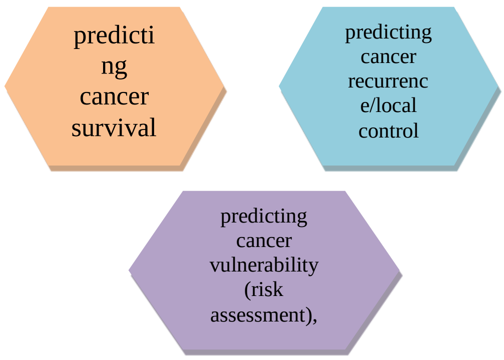

Figure 2. To make an accurate prognosis or forecast about cancer, three different predictive tasks must be taken into account.

Numerous ML methods, like ANNs and DTs, have already been put to use in the detection of cancer, and this practice dates back more than three decades. Since the most current data from Pub Med, there have been over 7510 papers on the topic of ML and cancer. For tumor detection and cancer classification or prognosis, the vast majority of these publications use data mining techniques and combine information from many sources. There has been a growing tendency over the last decade toward using additional supervised learning methods, such as support vector machines and boosting networks, for cancer diagnosis and prediction. [18]

IX. CANCER CONTROL THROUGH PERSONALIZED CARE PROVIDED BY INTERNET OF THINGS APPLICATIONS

- *Cancer patient hospitalization decision support*

Many other secondary illnesses and treatment-related adverse effects affect people who have cancer.

When patients have to wait too long, it may lead to either them risking their health by arriving at the hospital too late, or them having to visit the neonatal unit outside of business hours to go to the emergency department, both of which lengthen the patient's stay and increase expenditures. [19]

Table 2 outlines the oncology-specific individualized medical treatment made possible by internet-of-things-based apps.

Individualized medical care	***Eliminating or reducing the occurrence of diagnostics testing misreads***
The notion of tailoring healthcare to an individual's needs is not new. The ancient Greeks were already interested in personalized medicine. There may be a transition to data-driven decision-making if the healthcare sector educates its students on greater a larger sample size, more specific information per individual, including such biological traits, or information analytic algorithms that generate such things as pulse rate or constant glucose tracking.	Implementations like sensors alarms necessitate a reduction in erroneous negatives. Incorrectly diagnosing an illness or other condition as present when it is not is an example of a false positive result. For females, chest cancer is the top cause of death globally. The incidence of cancer diagnosis is higher among radiologists than among the general population. As a consequence, false positives occur in the all-encompassing diagnostic.

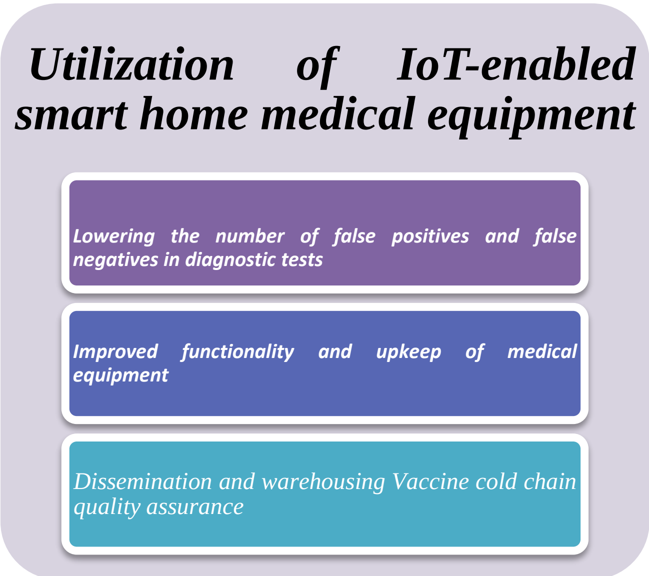

Fig 3. The value of healthcare applications of the IoT

- *There will be an improvement in the functionality or quality of the servicing of healthcare gear.*

Computerized healthcare devices are becoming more commonplace because of advances in technology and the proliferation of machine learning and artificial intelligence technologies that dramatically improve the accuracy of results.

Medical devices include anything from diagnostic equipment like ct scanners and ventilators to implanted cardiac and heart-lung devices to diabetes monitoring tools and incubators for newborns. Instruments' proper functioning and measurement are crucial to the health care provider's ability to assess the patient's condition. The risk of serious harm to or death of the patient is high if this is not done. [20]

CONCLUSION

The growing number of people affected by cancer is putting a strain on many societies. This is mostly attributable to inadequate healthcare infrastructure and prohibitive costs. Difficult cancer patients, who need constant monitoring to make correct diagnoses and treatment choices, are in a far more precarious position. Cancer is a serious illness, but early diagnosis and treatment may help alleviate many of the complications that might arise from it. Rapid cancer therapy has been greatly aided by recent breakthroughs in embedded technology, wireless networking, and remote data gathering. In this study, we described the architecture of a real-world cancer monitoring system in three layers. A functional framework is offered, detailing the key components and outlining the features of the proposed system's implementation. Generally, we expect that the use of classification algorithms will become increasingly ubiquitous in various clinical and hospital settings if research quality continues to improve.

REFERENCES

[1] "Acknowledgment to Reviewers of IoT in 2021", IoT, vol. 3, no. 1, pp. 122-122, 2022. Available: 10.3390/iot3010007.

[2] D. Vorobiof, L. Hasid, A. Litvin, I. Deutsch, and E. Malki, "1612P Real-world evidence data (RWED) of financial toxicity (FT) in cancer patients (pts) receiving immunotherapy drugs (IoT)", Annals of Oncology, vol. 31, p. S969, 2020. Available: 10.1016/j.annonc.2020.08.1921.

[3] M. Picone, "IoT: A New Open Access Journal for Internet of Things", IoT, vol. 1, no. 1, pp. 145-146, 2020. Available: 10.3390/iot1010009.

[4] P. Pradeep and K. Kant, "Conflict Detection and Resolution in IoT Systems: A Survey", IoT, vol. 3, no. 1, pp. 191-218, 2022. Available: 10.3390/iot3010012.

[5] T. Khan, "A Solar-Powered IoT Connected Physical Mailbox Interfaced with Smart Devices", IoT, vol. 1, no. 1, pp. 128-144, 2020. Available: 10.3390/iot1010008.

[6] S. Dutta, "Rock-Paper-Scissors-Hammer: A Tie-Less Decentralized Protocol for IoT Resource Allocation", IoT, vol. 2, no. 2, pp. 341-354, 2021. Available: 10.3390/iot2020018.

[7] C. Wheelus and X. Zhu, "IoT Network Security: Threats, Risks, and a Data-Driven Defense Framework", IoT, vol. 1, no. 2, pp. 259-285, 2020. Available: 10.3390/iot1020016.

[8] H. Nguyen-An, T. Silverston, T. Yamazaki and T. Miyoshi, "IoT Traffic: Modeling and Measurement Experiments", IoT, vol. 2, no. 1, pp. 140-162, 2021. Available: 10.3390/iot2010008.

[9] M. Noseda, L. Zimmerli, T. Schläpfer and A. Rüst, "Performance Analysis of Secure Elements for IoT", IoT,

vol. 3, no. 1, pp. 1-28, 2021. Available: 10.3390/iot3010001.

[10] C. Giannelli and M. Picone, "Editorial “Industrial IoT as IT and OT Convergence: Challenges and Opportunities”, IoT, vol. 3, no. 1, pp. 259-261, 2022. Available: 10.3390/iot3010014.

[11] K. George and A. Michaels, "Designing a Block Cipher in Galois Extension Fields for IoT Security", IoT, vol. 2, no. 4, pp. 669-687, 2021. Available: 10.3390/iot2040034.

[12] S. Tang and Y. Xie, "Availability Modeling and Performance Improving a Healthcare Internet of Things (IoT) System", IoT, vol. 2, no. 2, pp. 310-325, 2021. Available: 10.3390/iot2020016.

[13] K. Ito, S. Morisaki and A. Goto, "IoT Security-Quality-Metrics Method and Its Conformity with Emerging Guidelines", IoT, vol. 2, no. 4, pp. 761-785, 2021. Available: 10.3390/iot2040038.

[14] P. Battistoni, M. Sebillo and G. Vitiello, "An IoT-Based Mobile System for Safety Monitoring of Lone Workers", IoT, vol. 2, no. 3, pp. 476-497, 2021. Available: 10.3390/iot2030024.

[15] A. Jain, A. K. Yadav & Y. Shrivastava (2019), “Modeling and optimization of different quality characteristics in electric discharge drilling of titanium alloy sheet” material today proceedings, 21, 1680-1684

[16]E. Tuyishimire, A. Bagula, S. Rekhis, and N. Boudriga, "Trajectory Planning for Cooperating Unmanned Aerial Vehicles in the IoT", IoT, vol. 3, no. 1, pp. 147-168, 2022. Available: 10.3390/iot3010010.

[17] 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

[18] D. Mourtzis, J. Angelopoulos, N. Panopoulos and D. Kardamakis, "A Smart IoT Platform for Oncology Patient Diagnosis based on AI: Towards the Human Digital Twin", Procedia CIRP, vol. 104, pp. 1686-1691, 2021. Available: 10.1016/j.procir.2021.11.284.

[19] A. Jain, A. k. Pandey, (2019), “multiple quality optimizations in electrical discharge drilling of mild steel sheet” material today proceedings, 8, 7252-7261

[20] 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