International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 06 | June 2022 www.irjet.net p-ISSN: 2395-0072

Survey On Machine Learning Based Patient Monitoring Algorithm Using Oxygen Saturation

Kavya M[1], Harshavardhana Doddamani[2]

[1]*Student, S J C Institute of Technology, Chickballapur, Karnataka, India*
[2] *Assistant Professor, S J C Institute of Technology, Chickballapur, Karnataka, India*

Abstract - *For patients with cardiac and pulmonary problems, as well as those undergoing surgery, continuous monitoring of blood oxygen saturation level (SpO 2) is critical. In a clinical environment, SpO 2 monitoring is commonly used to assess the effectiveness of lung medicines and ventilator support. A pulse oximeter is a piece of medical equipment that measures the amount of oxygen in a person's bloodstream, or how much of the oxygen-carrying molecules known as haemoglobin) are simply transporting oxygen around the body. Pulse oximetry is based on the concept that two wavelengths can be used to choose between arterial blood oxygen levels, given that the measurements are made on the pulsatile component of the signal. Here, the system continuously monitors the temperature and Spo2 level in order to construct a machine learning-based algorithm for patient severity prediction and upload it to a private server at regular intervals. So, the doctor or carer can keep an eye on the situation from a far.*

Key Words: *Oximeter, spO2, Senso, Raspberry Pi,Pulse*

1. INTRODUCTION

The technology business was worth more than $22.5 billion in 2018, according to Global Data, and is expected to increase to $55 billion by 2023. (Global Data, 2019). Wearable gadgets have been employed in a variety of industries, but healthcare is the most potential use in terms of tackling rising healthcare expenditures, an ageing population, and the prevalence of chronic disease. Wearable technologies are self-contained, non-invasive devices that record, analyse, and collect biological data in the healthcare industry in order to improve human health and welfare. By focusing on diagnosis, treatment, monitoring, and prevention, recent innovations in healthcare have added value. Customization, early detection, remote patient monitoring (RPM), medication adherence, knowledge libraries, and improved decision-making are just a few of the advantages found throughout the healthcare value chain, all while cutting healthcare costs. Corporations that provide health technology to clients for a variety of reasons have taken notice of the growing demand and use of the technology (GlobalData, 2019). Experts predict that COVID-19 will remain for months, if not years, before being eradicated. Its cure depends on early detection and screening, which will define how it is treated. Because of the virus's quick contactless transmission, screening it is difficult. Furthermore, COVID-19 take a look at outcomes can take in to forty-eight hours to arrive. The medical community requires inexperienced techniques for detecting the virus with inside the least amount of time. (Mukhtar, Rubaiee, Krichen, & Alroobaea, 2021) In this study, we gift a technique for figuring out and tracking a patient's blood oxygen saturation tiers to decide the severity of the illness. We gather facts from them the use of IoT gadgets and remotely tracking their fitness situations. The proposed technique assists docs and healthcare specialists to reveal sufferers constantly and decide the severity of the circumstance via way of means of enforcing this detecting and tracking system. As a result, hazard on a patient's existence and the hazard of contamination to scientific employees may be decreased via way of means of the use of this early detection system.

Types of Patient Monitoring system :

Remote patient monitoring:

Remote patient monitoring (RPM) devices are expected to grow at a rate of 12.5 percent per year over the next decade. Given the cumulative effects of the ageing population, the high expense of in-patient care, and the immense demand on hospitals imposed by COVID-19, the trend is entirely predicted. More equipment for remote monitoring is being used by healthcare providers than ever before. In order to free up beds, many hospitals began remotely monitoring the vital signs and symptoms of both coronavirus and non-coronavirus patients. Authorities were in favour of RPM methods. The Centers for Medicare and Medicaid Services (CMS) in the United States has increased the list of telehealth services that can be reimbursed. And the US Food and Drug Administration (FDA) authorized the use of non-invasive devices designed for hospitals in home settings. Remote patient monitoring Also called telemonitoring and in-home monitoring, remote patient monitoring is the set of technologies and practices enabling healthcare providers to track real-time changes in a patient's health data from a distance and use it in a treatment plan. It's an integral component of the broader telehealth industry and e-health domain.

In addition, the US Food and Drug Administration (FDA) has approved the use of non-invasive hospital devices in home settings. Patient monitoring via the internet Remote patient monitoring, also known as telemonitoring or in-home monitoring, is a combination of technologies and procedures that allow healthcare providers to follow real-time changes in a patient's health data and use it in a treatment plan from a distance. It's an important part of the broader telehealth and e-health industries. An IoT system can be thought of as a remote patient monitoring system. It consists of four important components in the most common scenario: a personal medical device with a Bluetooth module, a patient mobile app, a cloud repository, and hospital-side software.

'Activity monitoring' is another term for process monitoring. The only objective of process monitoring is to track the usage of inputs and resources, as well as to examine how activities and outputs are provided, and it is applied at the early stages of a project. It is frequently carried out in conjunction with compliance monitoring and feeds into the impact assessment.

Compliance monitoring: As the name implies, compliance monitoring's goal is to assure adherence to donor restrictions, grant requirements, contract requirements, local governmental regulations and laws, ethical standards, and, most significantly, adherence to the project's desired outcomes. Compliance monitoring may be required at any point during the project life cycle.

Situation monitoring is a term used to describe context monitoring. It keeps track of the project's general environment. At any stage during the project cycle, context monitoring allows us to detect and measure risks, assumptions, or other unforeseen scenarios that may develop within the institutional, political, financial, and policy environment. These assumptions and hazards are external elements that are outside the project's control; nonetheless, context monitoring allows us to recognise them in time to influence the project's success or failure.

Beneficiary monitoring, also known as 'Beneficiary Contact Monitoring (BCM)', is a sort of monitoring that can be required at any point during the project cycle. Its main goal is to track the overall perceptions of project beneficiaries, both direct and indirect. It comprises beneficiary satisfaction or complaints about the project and its components, such as their involvement, treatment, resource access, and whether or not those resources are equal, as well as their overall transformation experience.

Stakeholder concerns and feedback mechanisms are also tracked through beneficial monitoring.

Financial Oversight: The main purpose of financial oversight is to measure the financial efficiency within a project. It tracks the actual spending and allocated budget of the project and helps the project team develop strategies to maximize results with minimal input. This is often done in combination with process and compliance monitoring and is important for accountability and reporting purposes.

Organizational Monitoring: As the name implies, organizational monitoring tracks organizational development, communication , collaboration , sustainability, and capacity building with partners and stakeholders within the organization and related to project implementation.

Result monitoring: Here, monitoring is intertwined with evaluation. Gather data to show the overall impact and impact of your project on target groups. This helps the project team determine if the project is doing well with the intended results and if there are any unintended consequences

Risk-based monitoring:

A risk-based approach to studying quality and monitoring clinical trials has a simple focus. Identify potential threats Plan to monitor these activities Adjust the monitoring method as needed However, RBM is a very subtle approach. Monitoring techniques should be tailored to the risks identified by the clinician, CRO, and / or sponsor. Significant risk can be monitored in a variety of ways, including the above methods (onsite, remote, centralized), but the ultimate effort is often a combination of these methods. All three clinical trial monitoring methods can be used together for effective monitoring, data integrity and patient safety monitoring and protection.

Centralized monitoring:

Central monitoring includes analytical assessments performed by a sponsor representative or representative at a central location other than where the trial is being conducted.

Onsite monitoring:

Onsite monitoring includes face-to-face assessments by the sponsor's representative or the representative of the study facility

Vital Monitoring:

Monitoring patient vital signs such as heart rate, blood pressure, and temperature is one of the most basic and important types of patient monitoring. As the patient's condition worsens, the first signs appear in his vital organs. The devices that monitor vital signs may vary depending on the information displayed. Most devices display at least the three vital signs mentioned above, but more advanced devices can also display respiratory or blood oxidation levels.

2. OBJECTIVE

The foremost goals of this have a look at are as follows: 1. To Collect oxygen saturation of sufferers 2. To layout and expand Machine getting to know primarily based totally set of rules for Severity Prediction of Patient 3. To validate the overall performance of evolved Machine getting to know primarily based totally set of rules for Severity Prediction

3. PROBLEM STATEMENT

Healthcare sensors embedded in wearable devices are pretty not unusual place those days. But using oximeters in wearable gadgets and far off tracking to stumble on signs of COVID-19 is fairly new. The present answers are both transportable oximeters which want to be person initiated however can't be placed on their palms for a long term or the oxygen video display units in hospitals which aren't transportable. If a medical doctor wishes to peer the SpO2 readings constantly over a protracted length of time, they should admit the patient. There is a gift scarcity of wearable, compact, wi-fi system that may transmit the SpO2 and pulse charge over IoT to the far off location, wherein the medical doctors can display the sufferers with out requiring them to be admitted to the hospital.

4. LITERATURE SURVEY

[1].A look at (Chen & Tang, 2020) mentioned how drastically movement disturbances should affect blood oxygen saturation tracking in a converting environment. Their look at offered a brand new adaptive set of rules primarily based totally on adaptive filtering to deal with the issue. They extensively utilized the envelope statistics of the PPG (Photoplethysmography) to retrieve the aspect of the photoelectric extent pulse charge wave, construct actions as reference signals, and perform adaptive filtering to suppress motion intervention primarily based totally at the interference evaluation of the photoelectric extent pulse wave sign in a converting environment. The adaptive cancellation method offered of their look at examines the calculation consequences after appearing virtual sign processing at the amassed unique data.

[2] In some other study, researchers (Mukhtar et al., 2021) invented a scientific tool made of collapsible sensors that may be used remotely and in real-time to reveal the fitness of folks who show off signs of the coronavirus or are inflamed with it. Wearable scientific sensors are coupled with an Arduino hardware interface and a telephone utility of their tool. An IoT framework changed into installed, permitting a couple of gadgets to attach in real-time. By utilising the algorithm, the scientific tool is used to come across the patient's crucial repute of the affects of the coronavirus or its signs with a pulse, cough, temperature, and oxygen concentration (SpO2).

[3] Recently, in a studies project, authors (Tham, Markom, Bakar, Tan, & Markom, 2020) evolved a tracking tool for the aged to evaluate coronary heart or pulse fee and outside capillary oxygen saturation (SpO2). MAX30100 changed into used because the front-cease sensor and the node MCU (ESP8266) to accumulate and transmit information to the cloud. Both are merged withinside the tracking gadget to get a median and bizarre classification. The tracking gadget for SpO2 and coronary heart fee is prepared to apply primarily based totally at the outcomes obtained. In addition, the IoT gadget permits a big wide variety of tested customers to hold song of the patient's repute.

[4] While Kadarina and Priambodo (Kadarina & Priambodo, 2018b) have designed the entire gadget of their studies that specializes in growing transportable clinical gadgets and statistics visualization on a pc-primarily based totally clinical pc the usage of an open-supply IoT platform. The cellular clinical tool may have the capacity to degree coronary heart charge and SpO2, abnormality reputation and ship them to the server wherein caregivers may have get right of entry to to view the statistics visualization. Recently a few researchers (Si et al., 2021) designed a helmet-hooked up wi-fi oxygen saturation tracking at the head (WORTH) to evaluate nearby cerebral oxygen saturation the usage of NIRS. A particularly included middle block, which incorporates an optical module, a CPU unit, a wi-fi verbal exchange module, and an strength control module, is included with inside the band. A regulated hypoxia check and a squat-to-stand check are used to evaluate the WORTH band's performance. The findings display that the WORTH band can correctly degree cerebral oxygen saturation, same to that of a scientific screen and that it may additionally be used throughout movement applications.

[5] In the early stages, researchers (Kanva, Sharma & Deb, 2014) used cell phone cameras to estimate pulse oximeter (SpO2) levels and heart rate. Chao Lietal. (Li, Hu & Zhang, 2017) has developed an IoT-based heart disease monitoring system. The system continuously analyzes patient vital signs such as blood pressure, ECG, SpO2, and associated environmental data. Finally, Adiputra et al. (Adiputra, Hadiyoso & Sun Hariyani, 2018) has developed a low cost SpO2 device for health monitoring using finger sensors and node MCUs. Data sent to the server, stored in the database, and displayed on the website.

[6] Another study by researchers (Ekawita, Nasution, Yuliza, Suardi, and Suwarsono, 2020) proposed a non-invasive glucose monitoring method based on a wireless data transmission system based on the Android application of mobile phones. With this method, the measurement data is sent automatically. In the recorded Android memory. After that, the patient can monitor his blood glucose level on a regular basis. In addition, automatic data storage makes measurements easier, faster, cheaper, and allows you to

access the data stored in your phone's memory anytime, anywhere.

4. PROPOSED SYSTEM

As specified, a wearable oximeter tool might be used to accumulate the oxygen saturation statistics the use of its sensor and ship it to the server thru a gateway. In this research, the device tool is composed of:

1. Heart rate and pulse oximetry sensor to study parameters required to calculate coronary heart price and SpO2.

2. The Raspberry Pi will interpret the sensor's uncooked statistics, degree coronary heart price and SpO2, after which switch it to the Raspberry Pi through USB serial wire.

3. Cloud platform may have a database device to preserve coronary heart price and SpO2 statistics in tables. Once the ordinary or atypical end result is given along side the uncooked statistics, a application will evaluate the cost received from the sensor to decide if it's far beneath or over the ordinary range, coronary heart price, and SpO2 values to the server. Then, the computation will show up to offer facts for a caregiver to determine at the early detection.

5. CONCLUSIONS

In this study, we gift a method for figuring out and tracking a patient's blood oxygen saturation stages to decide the severity of the illness. We acquire information from them the usage of IoT gadgets and remotely tracking their fitness situations. The proposed technique assists docs and healthcare specialists to screen sufferers constantly and decide the severity of the circumstance via way of means of enforcing this detecting and tracking system. As a result, threat on a patient's lifestyles and the threat of contamination to scientific employees may be decreased via way of means of the usage of this early detection system.

REFERENCES

[1] Adiputra, R. R., Hadiyoso, S., & Sun Hariyani, Y. (2018). Internet of things: Low fee and wearable SpO2 tool for fitness tracking. International Journal of Electrical and Computer Engineering, 8(2), 939–945. https://doi.org/10.11591/ijece.v8i2.pp939-945

[2] Ahmed, M. F., Hasan, M. K., Shahjalal, M., Alam, M. M., & Jang, Y. M. (2020). Design and implementation of an OCC-primarily based totally real-time coronary heart charge and pulse-oxygen saturation tracking gadget. https://doi.org/10.1109/ACCESS.2020.3034366

[3] Boudargham, N., Abdo, J. B., Demerjian, J., & Guyeux, C. (2017). Exhaustive Study on Medical Sensors. International Conference on Sensor Technologies and Applications, (September 2017), 1–2. Retrieved from https://hal.archives-ouvertes.fr/hal-03221928/

[4] Chen, Q., & Tang, L. (2020). A wearable blood oxygen saturation tracking gadget primarily based totally on bluetooth low electricity era. Computer Communications, 160(May), 101– 110. https://doi.org/10.1016/j.comcom.2020.05.041

[5] Dias, D., & Cunha, J. P. S. (2018). Wearable fitness gadgets-important signal tracking, structures and technologies. https://doi.org/10.3390/s18082414

[6] Ekawita, R., Nasution, A. A., Yuliza, E., Suardi, N., & Suwarsono, S. (2020). Development of Non-Invasive Blood Glucose Level Monitoring System the usage of Phone as a Patient Data Storage. Jurnal Penelitian Fisika Dan Aplikasinya (JPFA), 10(2), 103. https://doi.org/10.26740/jpfa.v10n2.p103-113