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Biomedical Sensors Data Acquisition with Labview Using Machine Learning: A Review

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Abstract: ***In recent years many techniques has shown potential in solving the real-world problems. The objective of this paper is to put together the popular optimization techniques for understanding and utilize them for the benefit of the society. The early prediction of the disease can help the social health to be more leaning towards positive ratio. The main aim is to make the person aware about the health and the problems that he will be facing. This can lead the person to consult the doctor or physician at the correct time and acquire proper treatment or measures as required. As it is well said, precautions are better than cure, one must be cautious about the health factor and look deep into it. This project aims at spreading awareness among people by using different biomedical sensors that are available. For the easy analysis of the data that is been collected in the real time can be graphically represented by using the most popular LabVIEW software. Looking forward into the global technical world around, we can see the new technologies like artificial intelligence and machine learning emerging into the data handling. This machine learning will help us to calculate and optimize accurate results and the prediction rate would be more efficient.***
Keywords: LabVIEW software, Machine Learning, Biomedical Sensors, Data Acquisition

I. INTRODUCTION

According to recent research conducted till date, it is been observed that most of the deaths that have occurred is due to ignorance or improper detection of the health parameters. The need to have an athletic ageing society requires considerable help from the trending progressive mechanism. Considering that technologies are been developed to assist the activities of human beings and to make their life a better living, the pre-diagnosis would definitely be a booster for the social health. The fast evolution and validation of the general practicability, also the scientific effectiveness, social else legal plausibility, the technical effects on it and the acceptability by end-users of the co-operating machines or well termed as robot that are combined with smart surrounding and working in the diversified environments such as domestic appliances, floor-through and the outdoors. The project setup is used to record different physiological parameters of human. The data is collected from the sensors and is analysed, computed using machine learning. The product outcome of the system would be an analysed and computed data, which plays an important role in the diagnosis. This is significant on the grounds that anybody could basically gain the software and start gathering information right away. Since a significant objective of the undertaking is to not meddle with the medical procedure being finished by utilizing muddled software, this is beneficial. Likewise, another benefit to the software comes as different data sources, and Bio Bench is fit for utilizing sixteen information channels.

II. LITERATURE SURVEY

Dilip et al[1] has suggested in this study that a system be developed that can convey critical patient health information, such as temperature, heart rate, and ECG, wirelessly to a doctor at a remote location. The embedded controller, called myRio, that is coupled to the human body has been addressed by the author. With the help of the LabVIEW tool, the author has processed data in real time. [1]

Gaurav[2] has talked about the temperature-measuring sensor project that is carried out using an Arduino Uno and the Laboratory Virtual Instrument Engineering Workbench. Our temperature sensor is the LM35, whose output voltage varies linearly as a function of temperature in celsius. We are able to measure the temperature conveniently in degrees Celsius, giving us an advantage over other sensors. To read output voltage and connect a temperature sensor to an Arduino Uno, LabVIEW 2012 offers a straightforward interface. LabVIEW then presents the observed temperature data obtained in real time in graphical form. [2]

Kunja et al[3] presented the LI-Care virtual health monitoring system, which uses LabVIEW and the Internet of Things (IoT) to provide a diagnosis of the patient's health in a practical way. Before calculating the Root Mean Square (RMS) errors for each parameter, the proposed system's parameters were checked using common measurement techniques.

The temperature measurement's greatest RMS inaccuracy was 0.159% at a 1 Watt/h power consumption. RMS errors for the measures were similarly 0.05% Systolic pressure was measured at 0.059%, diastolic pressure at 0.029%, heart rate at 0.002%, oxygen saturation at 0.076%, and electrocardiogram (ECG) at 0.015%. [3]

Thamer et al[4] being discussed This paper's major objective is to compare and contrast the forecast error and accuracy of ML algorithms for short-term load forecasting (STLF). The study provides a brief overview of the numerous machine learning (ML) techniques, which include neural networks (NNs), Performance has been evaluated using decision tree classifiers (DTC), logistic regression (LR), support vector machines (SVM), nave Bayes (NB), and K-nearest neighbour (KNN). [4]

Leo Wang et al[5] It is provided a machine learning-based infection prediction for COVID. We evaluate the accuracy of prediction for each of five ML models. In order to reduce the overhead associated with prediction while maintaining the quality of the prediction, we pick essential features for prediction using the Chi-square test and knowledge-based manual feature selection. [5]

Jinwei Lin et al[6] when the Labview programme wants to meet the demand of the A machine learning-based infection prediction for COVID is offered. For each of the five ML models, we assess how accurate the predictions are. In order to reduce prediction overhead while preserving projection quality, we choose important characteristics for prediction using the Chi-square test and a knowledge-based human feature selection approach. performing a third-party database and performing file IO operations both have their benefits and drawbacks for data storage. These elements were discussed in this section. After that, instructions on how to establish a database using TDMS are provided, along with an explanation of the characteristics and essential ideas of this type of native, rapid TDMS database that Labview supports. The use of the TDMS database to provide the fundamental CRUD functions in a relationship database is then covered in the section on research and implementation methodologies. TDMS data can now be used for more intricate processes thanks to a suggested data processing interpreter. The primary task of this programme is to transform data in TDMS format into two-dimensional arrays. In the following section, this article shows how to give the TDMS database native SQL language support. The database design employing the TDMS data format is finally given a thorough study and explanation. [6]

NAGARJUN GOWDA et al[7] The spy robots are remotely controlled vehicles with cameras. The LabVIEW Front Panel and PC's Parallel port are used to control the 2-wheeled Wireless Robot Car. Using a 433 MHz RF-module, wireless connection is achieved. The purpose of a spy robot is to look for intriguing things in places where humans are unable to get. It may go anywhere and then come back to its house by using the wheel encoder. It is a tiny robot created to keep an eye on things, to observe them, and to assess them.[7]

Chen Long et al[8] Then, along with instructions on how to construct a database using TDMS, the characteristics and core ideas of this type of native, rapid TDMS database that Labview offers are explained. The system can accommodate users' needs for data collecting and monitoring thanks to its straightforward hardware and user-friendly software interface.[8]

Oleksandr et al[9] The framework, key software modules, and test results of a hybrid laboratory setup based on the Internet of Things are explained. According to the authors, the stand could be used as both a typical lab research stand and a remote research module.[9]

Krasimir Kishkin et al[10] describes how to use LabVIEW to build a virtual tool that simulates the energy flows that take place during the charging of a system of supercapacitor cells that are wired in series. Its underlying equations are supplied, along with a description of the first charging method. Using the offered tool, one can change a number of essential energy storage system settings and assess whether the algorithm is suitable.[10]

Lonel Pavel et al[11] Due to the COVID-19 epidemic, much effort has been made towards the transition from traditional to online education. Because electrical engineering laboratories use equipment that students cannot access, many ideas have been developed to use a variety of teaching techniques. Virtual tools have been created to monitor and operate laboratory equipment as a solution to this issue. Developing a remote laboratory to measure a DC motor's speed can be solved, as we demonstrated in this paper. The ability for students to interact remotely with workstations in class, shorter workdays, more accurate measurement of values, automatic graph generation, and a decrease in measurement mistakes are the method's biggest benefits..[11]

Punitha et al[12] For the Internet of Things to produce a vast volume of data, intelligent data processing is required. We advance artificial intelligence, machine learning, and deep learning in smooth, automated, consistent ways. to perform data analysis utilising machine learning techniques from the deep learning category. Through the use of several artificially intelligent algorithms and machine learning, this inquiry developed and put into use an intelligent system that is utilised to identify the increase of Covid-19 instances. Based on performance metrics' accuracy, the best algorithm is selected here for Covid 19 Omicron cases prediction..[12]

Youyou et al[13] Neural networks are a well-liked and significant topic of research in the fields of machine learning, etc., and other fields. The use of neural networks for picture categorization offers great research value, according to the direction of academic research at the moment. Due to the quantity of such publications that cover an extremely wide range of topics, it can be difficult to understand the main point of a quote right away.

A few notable foundational works and ground-breaking inventions have been picked out and organised. After careful analysis and synthesis, we provide an improved algorithm for each of the earlier methods. In terms of performance, efficacy, and other factors, this improvement is helpful. [13]

Yinglong Li[14] a suggestion The discipline of image recognition heavily utilises deep learning, a technological instrument with a wide range of potential applications. The theoretical relevance and practical value of image recognition technology in promoting the development of computer vision and artificial intelligence will be taken into consideration as this study discusses and investigates the usage of deep learning in picture recognition. The history of icon recognition technology is first described, and then the three primary deep learning learning models of We introduce three types of neural networks: generative adversarial, recurrent, and convolutional. This is followed by a comparison of the three learning models. In the final portion, the study results in the areas of face identification, remote sensing image categorization, and medical image recognition are all examined and explored. The evolution of deep learning is also examined in this paper. for image recognition and concludes that the efficient recognition of video images and theoretical model reinforcement will be the future development path. [14]

Xiong Xianhong et al[15] As the social economy has grown, Internet of Things (IOT) communication technology is now widely used in a variety of areas, including smart agriculture, smart cities, smart homes, and industrial control. Many conveniences for our daily lives are also provided by this technology. Using embedded systems and Internet of Things communication technology, we created a multi-point data acquisition system in this paper. It can function as an embedded system's AD converter, collecting multi-point experimental data in real-time and sending it across the Internet of Things to the control interface. Real-time test data viewing will be convenient for users, and this will allay their security worries while the system is in operation. The experimental results show the reliability of the collection system and the capability of the multi-point data collecting system to follow changes in multi-point data in real time. [15]

Semakaleng et al[16] The primary goal of this work is the creation and implementation of a distributed data gathering system to collect various environmental indicators utilising sensors. This work tackles a deficiency in the existing literature by failing to take into account the function that the idea of real-time monitoring plays. We investigated the amount to which and the methods in which real-time monitoring may advance the idea of data collecting. We do this to make data access via smartphones from any location in the world easier. This study introduces an application for a distributed data collecting system for mobile real-time monitoring. Two sensors make up the system: the DHT22 barometer sensor, which detects temperature, pressure, and altitude, and the BMP180 temperature, humidity, and barometer sensor. A Raspberry Pi is employed for data collecting, and it gathers information from the linked sensors. To communicate with the outside world, the Raspberry Pi includes built-in Wireless Fidelity (Wi-Fi). To enable real-time monitoring from a smartphone or other intelligent mobile device, a webserver called Thingspeak is constructed and deployed on the Raspberry Pi. The environment's temperature, humidity, air pressure, and altitude may all be monitored by logging into Thingspeak. This study provides an overview of the body of literature, describing the development of real-time data capture across a broad range of industries while concentrating on a specific subset that addresses digital-based data acquisition. In this study, we investigated how people's perceptions of various data collection systems' sensing and analytical skills, as well as their accuracy and dependability in large and small enterprises, were examined. [16]

L Ashok Kumar et al[17] The reader gains a working knowledge of LabVIEW software in this chapter. It provides an introduction to LabVIEW's graphical programming environment. Furthermore, it offers a basis for using this programme to solve any real-time challenges. Instead of writing lines of text to programme an application, LabVIEW is a graphical programming language. In contrast to text-based programming languages, where commands dictate how a programme is carried out, LabVIEW makes use of dataflow programming, in which the progression of a programme is determined by the flow of data.[17]Laith Zeyd-Kilani et al[18] shows how to automate data collection and data post-processing during structural testing using LabVIEW software. The creation of testing reports could be sped up by using Labview, particularly when repetitive testing is being done to gather statistics. The article displays automation created during tests of oil tank models and aluminium bridges..[18]

Chance Elliott et al[19] Data acquisition and automated control are the foundations of the graphical programming language LabVIEW from National Instruments. For scientists and engineers to have an easy-to-use programming environment, it was given a graphical form that resembles a process flow diagram. It has evolved into a general-purpose programming environment over the last 20 years. In an automated context, LabVIEW is a fantastic option because to a number of essential capabilities. Strong toolkits for process control and data fitting, rapid and easy design of user interfaces, a helpful code execution environment, simple network connectivity, turnkey implementation of well-known communication protocols (such as RS232, GPIB, etc.), and more are a few of them. As we demonstrate the language's capabilities, we discuss the language's benefits and provide a sample application suite that was developed in-house and used for integrating and maintaining automation equipment. [19]

Jaydip Sen et al[20] Especially in the fields of reinforcement learning, natural language processing, image and speech recognition by robots and computers, emotional comprehension and processing, and reinforcement learning deep learning method systems have advanced quickly in recent years. The current volume offers a few state-of-the-art research projects and their practical applications, such as computer digitization, healthcare and health care systems, and trading in stocks. This is in line with the development of increasingly creative applications for deep learning and artificial intelligence, as well as the rising relevance and significance of machine learning models, algorithms, and their applications.Especially in the fields of emotional processing and understanding, natural language processing, computer and robot vision, image processing, and reinforcement learning, machine learning algorithm systems have improved quickly in recent years. In the most recent version, a number of cutting-edge research initiatives are given, along with illustrations of how they are being applied in actual contexts like stock trading, healthcare and medical systems, and software automation. This is consistent with the expansion in the significance, usefulness, and variety of machine learning models, algorithms, and applications, as well as the introduction of more sophisticated and innovative AI use-cases. [20]

II] Tables And Figures:

TABLE I.

Health Parameters	Feature Selection Method	Selection of subset of features	Classification method	Result Evaluation
ECG	Boruta	Top 14	GB	Accuracy
Blood Pressure	RFE	Top 21	XGB	Precision
Lung capacity	RF	Top 16	Bagging	Sensitivity

Fig. 1. Comparison of different Technologies used.

TABLE II

Sr. No.	Authors	Software/technology Used	Controlling Device	Monitoring parameters	Results	Remarks
1.	Dilip ,Yogini Dilip Borole,S Sumalatha, HM Nethravathi	Wireless technology, LabVIEW software	myRio embedded controller	ECG	Remote location real time data processing	Analysis Conducted using myRio controller in LabVIEW
2.	Gaurav Soni	LabVIEW software	Arduino Uno	Temperature	graphical representation of measured temperature data that was obtained in real-time.	Analysis done using Arduino Uno in labVIEW
3.	Kunja Swain, Murthy Cherukuri, Sunil Kumar Mishra, Bhargav Appasani	Internet of Things, LabVIEW software	myRIO-1900	Health Parameters	The systolic pressure measurement had an RMS error of 0.05%, the diastolic pressure measurement an RMS error of	RMS Error checking and corrected in labVIEW and IoT

					0.029%, and the breathing rate measurement an RMS error of 0.059%.	
4.	THAMER ALQUTHAMI, MUHAMMAD ZULFIQAR,MUHAMMAD KAMRAN, AHMAD H. MILYANI ,AND MUHAMMAD BABAR RASHEED	Machine Learning platforms	-	-	evaluating the forecasting precision and imprecision of a number of development of 'thinking' computer systems. algorithms for short-term load forecasting (STLF).	Different ML algorithms have been implemented to analyze the performance .
5.	Leo Wang, Haiying Shen, Kyle Enfield, Karen Rheuban	Chi-square test	-	Corona disease symptoms	development of 'thinking' computer systems based COVID infection predictor	Prediction of COVID-19 Infection.
6.	NAGARJUN GOWDA, Dr RAVI KUMAR A V, SHREENIDHI H S	Wireless technology, LabVIEW software	433 MHz RF-module	-	Surveillance and monitoring using wireless camera	Spy-robots for surveillance, observation and assessment purposes.
7.	Chen Long, Li Zhuo	DAQ using CAN bus, LabVIEW software	-	Various automobile parameters	A Lab View -based real-time operation data monitoring system for automobiles	Monitoring different parameters of automobile using CAN bus and LabVIEW software.

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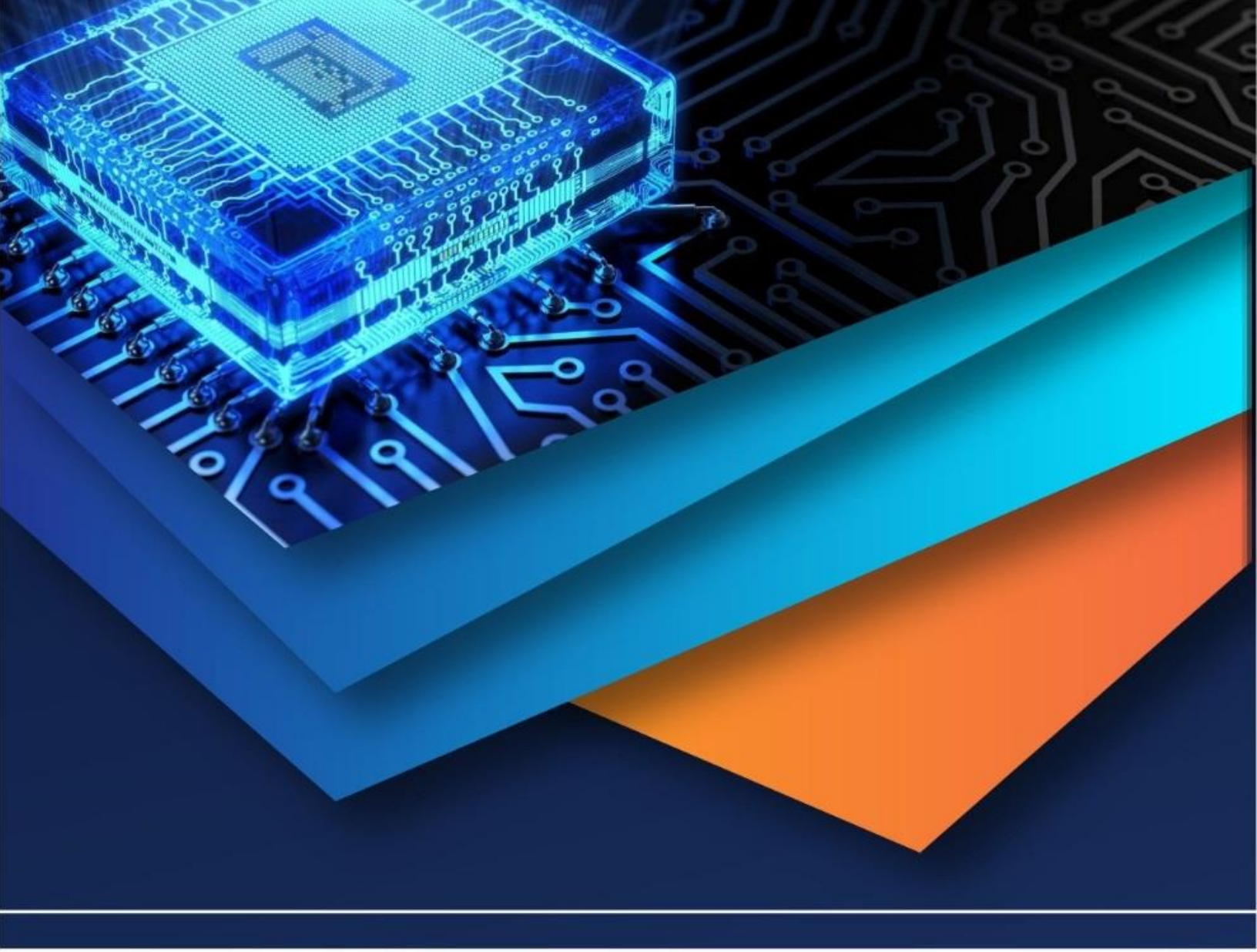

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