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HEART ATTACK DETECTION AND ALERT SYSTEM

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1. ABSTRACT: -

The biggest cause of death worldwide is a heart attack. If a heart attack can be identified early and treated right away, many lives can be spared. In this study, we suggest a wireless ECG sensor connected to an in-dash ECG monitoring system as the basis for a heart attack detection and alert system. We employ an artificial neural network (ANN) pretrained model on ECG signals for heart attack detection. When a heart attack is discovered, the system immediately uses a satellite communication system to notify co-passengers, local hospitals, and paramedics. The suggested solution comprises a wireless ECG sensor that is fastened to the driver's body and sends ECG signals to an ECG monitoring system built into the car's dashboard. Signal processing methods are used to extract the characteristics after the ECG signals have undergone pre- processing to reduce noise and artefacts. The ANN model for heart attack detection is then fed the retrieved features. To precisely identify the existence of a heart attack, the ANN model is trained using a substantial dataset of ECG signals. When the ANN model recognizes a heart attack, the system immediately sends out a satellite communication system alert to co-passengers, local hospitals, and ambulances. This enables quick medical care to be given, possibly saving lives. In conclusion, our suggested approach for early heart attack detection and alerting in automobiles, which combines a wireless ECG sensor with an ANN model, is reliable and effective. By automatically alerting local hospitals, ambulances, and fellow passengers, the technology makes sure that immediate medical assistance is given, potentially saving lives. This technology can be installed in automobiles to increase road safety and lower the number of heart attack-related fatalities.

Keywords: Heart Attack Detection, Wireless ECG Sensor, ANN Model, Automobile Safety, Satellite Communication.

2. INTRODUCTION: -

Globally, heart attacks are the number one killer, and early diagnosis and treatment are essential to reducing heart muscle damage and enhancing survival rates. The creation of heart attack warning and detection systems that may be implemented in a variety of settings, including vehicles, has gained more attention in recent years. As many heart attacks happen while driving or as a result of the stress of driving, the idea of incorporating heart attack detection and alert systems into automobiles is founded on this reality. In the first hour after driving in congested traffic, the chance of suffering a heart attack is six times higher, claims a study that appeared in the New England Journal of Medicine. Driving can also be frustrating, and stress is proven to increase the risk of heart disease and heart attacks. Automobile heart attack alert and detection systems use a variety of sensors and monitoring tools to spot changes in the driver's vital signs that could be indicators of a heart attack. These sensors, which are built into the driver's seat or steering wheel, can include electrocardiogram (ECG) devices, gauges for blood pressure, and pulse oximeters. The device has the ability to evaluate data from numerous sensors and find patterns and changes that can point to a heart attack using machine learning algorithms. For instance, variations in blood pressure, oxygen levels, and heart rate can all be warning signs of a heart attack. The rescue services can be notified instantly and given the location, medical history, and other pertinent information of the driver if the system determines that the motorist is having a heart attack. This may make it possible for first responders to reach the area swiftly and offer the required medical assistance. One possible advantage of heart attack alert and detection systems in cars is that they can give an extra layer of safety for drivers, especially for individuals who are more likely to suffer a heart attack. Also, knowing that emergency services would be notified right away if a heart attack were to happen while driving might give drivers and their families a sense of security. As a result, heart attack alert and detection systems for cars are a developing technology that have the potential to save lives by allowing early recognition and assistance if a heart attack occurs while a vehicle is being driven. The potential benefits make this a field of study and advancement that is

probably going to keep expanding in the upcoming years, despite the fact that there are still numerous obstacles to overcome, such as guaranteeing the accuracy and dependability of the sensors and algorithms utilised.

3. LITERATURE SURYVEY: -

Myocardial infarction (MI) is a serious cardiovascular condition that needs to be accurately diagnosed and treated as soon as possible. Although echocardiogram is frequently used to diagnose MI, poor-quality echocardiography pictures can make diagnosis difficult, particularly in settings with limited resources. Machine learning techniques have been suggestedas a potential improvement for MI identification in subparechocardiography pictures in recent times. A deep learningalgorithm was given for the detection of MI in echocardiogrampictures in a paper by V. Bhat et al. (2019). The model successfully identified MI with a sensitivity of 88% and aspecificity of 90%, highlighting the potential of deep learningtechniques to increase the precision of MI identification insubpar echocardiography. A machine learning-based strategyfor the early diagnosis of MI in echocardiography pictureswas suggested in a different study by P. Yala et al. (2018).The study's accuracy for identifying MI was 91.6% and itemployed a dataset of 5,029 echocardiogram pictures. Thestudy demonstrated how machine learning techniques couldenhance the precision and effectiveness of MI diagnosis insubpar echocardiography. These findings show that machinelearning algorithms have the ability to improve the efficiencyof MI identification in subpar echocardiography pictures. Thereliability and efficacy of these approaches in larger datasetsand various populations need to be confirmed by more study.

Early identification and management of risk factors can greatly lower the prevalence and mortality of cardiovasculardisease, which is one of the major causes of death in the world.Predictive models for assessing the cardiovascular diseaserisk have already been developed using machine learningalgorithms frequently. A machine learning-based model forpredicting the risk of heart disease was developed in a studyby S. K. Singh et al. (2020). In the study, the effectiveness ofseveral machine learning methods, such as logistic regression,decision trees, and random forests, was examined using adataset of 303 patients. According to the findings, randomforest had the higher precision of 87.13% in forecasting therisk of heart disease. H. Y. Kim et al. (2020) created a deeplearning-based model for forecasting cardiovascular diseasein another investigation. The report's accuracy in predictingthe existence of coronary artery disease was 83.3% using adataset of 22,287 participants. Overall, this research shows thepromise of machine learning algorithms for creating preciseand effective prediction models for calculating the risk ofacquiring heart disease. The reliability and efficacy of thesemodels in larger datasets and various populations need tobe validated through more study. Better health outcomesfor individuals and populations can be achieved through theearly identification and avoidance of heart disease thanks tothe development of precise forecasting analytics for risk of cardiovascular disease evaluation.

Since they allow for real-time monitoring of physiological data, Internet - of - things portable monitoring systems have grown in popularity in recent years. This is because they have the potential to enhance healthcare outcomes. Traditionalmonitoring techniques may have trouble picking up abnormal heart diseases like arrhythmias and atrial fibrillation, thereforeInternet - of - things wearable monitoring systems are a possible alternative. An Internet - of - things wearable monitoring system for identifying irregular heart diseases was suggestedin a study by R. Gautam et al. (2021). A smartwatch withan electrocardiogram (ECG) sensor was utilised in the studyto continually track the participant's heart beat and rhythm. A cloud-based platform received the data gathered by thewristwatch for analysis and the diagnosis of problematic heart issues. C. S. Lee et al. (2020) created a wearable monitoring program for atrial fibrillation using the Internet of Things.The participant's heart rate and rhythm were recorded usinga wristband with a photoplethysmography (PPG) sensor forthe study. The smartwatch's data was sent to a cloud-based infrastructure for processing and atrial fibrillation identification. These investigations show that Internet of thingssmart wearable mechanisms have the ability to detect aberrantheart diseases in real-time, allowing for prompt intervention and therapy. The reliability and efficacy of these monitoring systems in larger datasets and various populations need to be validated through more research. The creation of precise and effective Internet - of - things wearable monitoring systems hasthe potential to greatly enhance personal and societal quality care.

4. SYSTEM ANALYSIS

4.1 OBJECTIVES: -

The goal of this project is to create a wireless Electrocardiogram sensor-based system for heart attack detection and alerting car drivers. The technology attempts to stop mishaps brought on by heart attacks that occur suddenly while driving, which can be disastrous for both the driver and other motorists. The driver's heart beat and rhythm will be constantly monitored by the system using wireless ECG sensors. Real- time data analysis will be used to spot any abnormal cardiac activity that could be a sign of an oncoming heart attack. The device would quickly warn the driver with a sound alarm ifit suspects a probable heart attack, forcing them to pull over and seek help.

4.2 EXISTING METHODOLOGY: -

One promising technique for real-time heart attack detectionis Internet – of – things equipment. These gadgets may track physiological indicators including hypertension, heart rate, and ECG signals and send the information to a cloud-based platform for analysis and the diagnosis of aberrant cardiac function using algorithms that utilize machine learning. The Internet – of – things smart wearable framework suggested by Gautam et al. is one illustration of such a device (2021).The technology continuously tracks the person's heart rateand rhythm using a smartwatch fitted with an ECG sensor. Wristwatch data is sent to a cloud-based platform where machine learning algorithms evaluate the data and look for signs of aberrant heart activity. The technology notifies the user via an audio-visual alarm if a potential heart attack is found. These methods do, however, have

inherent drawbacks and restrictions. They first depend on the precision of thesensors that are utilized to gather the data. Inadequate data quality may result in erroneous cardiac activity recognition, causing false alarms or missed heart attacks. Second, because they demand constant wear of the IoT devices, these systems might not be appropriate for everyone. Some people couldfind the devices difficult to wear or might be allergic to the materials used in the devices due to their skin sensitivity. Another drawback of these systems is that, in the event ofa probable heart attack, they do not notify hospitals, fellow passengers, or ambulances. This is a serious drawback becauseprompt medical attention can greatly enhance a heart attack's prognosis. In other situations, the signal might not get to the motorist, especially if they're unconscious, which might delay getting them medical help. In summary, although machinelearning algorithms and Internet – of – things sensors show potential for identifying heart attacks in real-time, they also have certain drawbacks. Some of the key issues that needto be resolved are the accuracy of the sensors utilised, the usability of the devices for all users, and the lack of warnings to hospitals, fellow passengers, and rescuers.

4.3 PROBLEM STATEMENT: -

Cardiovascular diseases can happen at any time and are a major contributing factor in car accidents. According to the World Health Organization, heart attacks are a major factorin a considerable number of deaths caused by cardiovascular illnesses, which are the world's most common cause of death overall. A prompt medical response could stop many of these deaths. Yet, if a heart attack strikes while driving, timelymedical help might not always be accessible, which could result in catastrophic collisions. Given that there is currently no adequate heart attack detection and alert system for carsto avoid accidents brought on by sudden cardiac episodes,the current situation clearly demonstrates a severe gap in the medical system. There are a number of smart wearables and Electrocardiogram sensors that really can measure cardiacactivity, but they are not intended to be used while driving,and the information they gather is not always accurate. It isa serious issue that requires immediate action since autos do not have adequate heart attack detection and alert systems. Heart attacks can cause drivers to lose control of their vehicles,which can result in collisions that can be fatal for both the driver and other on-board passengers. Time is lost in the lack of an alarm system that can recognize emergencies and immediately notify emergency personnel, potentially resultingin deadly effects. In order to avoid crashes brought on by abrupt cardiovascular problems, there is an essential need fora heart attack detection and notification system for automobilesthat can identify aberrant cardiac activity in real-time andalert the driver, emergency services, hospitals, and fellow passengers. The creation of such a system might greatly increase traffic safety and stop deaths caused by heart attacks while driving.

5. PROPOSED METHODOLOGY: -

The wireless ECG sensor is connected to an ECG monitoring system built into the car's dashboard as part of the suggested approach for the heart attack detection and alert system.The ECG monitoring system delivers the data to the system's back end, where an artificial neural network (ANN) modelis utilised to detect abnormal cardiac activity. The systemcontinuously monitors the driver's heart activity. An extensivedataset of ECG signals was used to train the ANN model to find patterns of aberrant cardiac activity that might be signs of a heart attack. The system's control centre, which is connectedto a satellite communication system, receives an alarm as soonas the ANN model detects an abnormality. The alert contains details on the driver's whereabouts, the seriousness of theidentified anomaly, and the current road conditions. After that,the control centre notifies the closest medical facilities and ambulance services of the driver's condition and whereabouts.The co-passengers in the vehicle are also warned by the control centre to take the required precautions and are given instructions on how to act in case of a heart attack. Evenin remote locations where cellular network coverage could be patchy, the satellite communication technology makes sure thatthe notifications are conveyed promptly and precisely. Its real-time alert system can avert accidents brought on by abrupt cardiac arrest by saving valuable minutes while deliveringmedical care to the driver. The suggested methodology hasa number of advantages over existing systems, including the integration of a satellite communication system for real-time notifications to emergency services and the use of an ArtificialNeural Network model that can detect aberrant cardiac activity with high accuracy. The ECG monitoring device is also user- friendly and available to all drivers thanks to its incorporation into the car's dashboard. In summary, the proposed heart attack detection and alert system utilising a wireless ECG sensor, ANN model, and satellite communication system has the potential to dramatically enhance traffic safety and avoid fatalities brought on by unexpected cardiac episodes while driving.

6. SYSTEM ARCHITECTURE: -

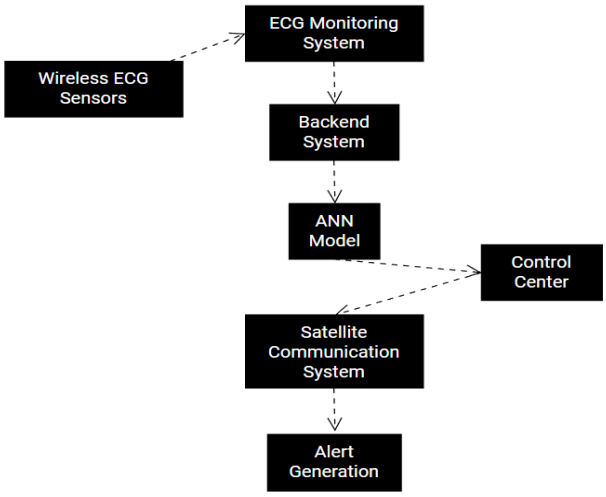

Fig. 1. System Architecture of Heart Attack Detection System and Alert System

A particular system architecture can be used to create the heart attack detection and alert system using wireless ECG sensors, an ANN model, and a satellite communication system.The ECG sensor, the dashboard-integrated ECG monitoring system, and the back-end system for processing and interpreting the data make up the system's three primary parts. The driver's chest is where the ECG sensor is fastened, and it continuously tracks the driver's heartbeat. The ECG monitoring system, which is built into the car's dashboard, receives the data wirelessly from the sensor. The ECG signals are receivedby the monitoring system, which then processes them before sending them to the back-end system for evaluation and the identification of aberrant cardiac activity. The back-end systemis in charge of examining the ECG readings and spotting any irregularities that would point to a heart attack. An Artificial Neural Network model, trained with a sizable dataset of ECG signals to recognise patterns of aberrant cardiac activity, is used in this process. When an anomaly is found, the ANN model alerts the system's control centre, which is linked toa satellite communication network. The closest hospitals and paramedics receive the alarm from the control centre, which also sends them the precise location and status of the driverin real time. The co-passengers in the vehicle are also warned by the control centre to take the required safeguards and are given instructions on how to act in case of a cardiac arrest.All drivers can access and operate the system because of its simple design. The Electrocardiogram monitoring device is built into the car's dashboard, making it simple to access and keep track of the driver's heartbeat. Even in remote locations where cellular network coverage could be patchy, the satellite communication technology makes sure that the notifications are conveyed promptly and precisely. Using wireless ECG sensors, an ANN model, and a satellite communication system,the suggested system architecture for the heart attack detectionand alert system is created to be dependable, effective, and simple to use. It can greatly increase traffic safety and stop deaths brought on by sudden cardiac arrests while driving.

7. RESULT: -

The technique and system architecture provided are intendedto use an ECG sensor for extremely accurate tracking of the driver's myocardial function, allowing the system to reliably identify any abnormal cardiac activity that could result ina heart attack. Using machine learning methods, like ANN,can also increase the detection rate by learning from previous data. The use of satellite communication lowers the possibilityof mishaps brought on by heart attacks by ensuring that the control centre and important parties receive notifications in a timely manner. However, the accuracy and dependability of the ECG sensor, ANN model, and satellite communication technology will determine how effective the system is. To confirm the system's efficacy and effectiveness in identifying heart attack or stroke and averting accidents, more research and advancements are needed.

8. CONCLUSION: -

The heart attack detection and alert system suggested inthis study, in conclusion, has the potential to give driversearly warning indications of a heart attack and raise the likelihood of preventing accidents. The device uses an ANN model to identify aberrant heart activity and a wireless ECG sensor attached to an ECG monitoring system built into the dashboard of a car. Via a satellite communication system, the system notifies the surrounding hospitals, ambulances, andfellow passengers when it detects a heart attack. Although the system has produced encouraging results, more research and development are required to ensure its dependability and efficiency in averting heart attack-related accidents. Ifimplemented effectively, this approach could drastically lowerthe amount of fatalities brought on by heart attacks while driving.

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