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Late on Sepsis Prediction Using Machine Learning Algorithm

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ABSTRACT: Early-onset sepsis (EOS) occurs in newborns within the first 72 hours after birth.It is commonly caused by bacterial transmission from the mother during delivery or infections in the NICU.EOS is a life-threatening condition that requires immediate medical attention.It can affect healthy newborns, as well as premature or already ill infants.EOS may be caused by various bacteria and other pathogens. Both early-onset and late-onset sepsis are serious and require early diagnosis and prompt treatment.Delayed treatment can lead to rapid disease progression and severe complications.Early detection is critical to improving survival and reducing complications.Sensors and machine learning (ML) techniques help identify early warning signs of sepsis

KEYWORDS: Sepsis prediction, machine learning, early diagnosis, healthcare analytics, clinical decision support, time-series data, patient monitoring, predictive modeling, medical data analysis, critical care

I. INTRODUCTION

NEONATAL sepsis is one of the main causes of neonatal mortality, accounting for 15% of total neonatal deaths worldwide. Neonatal sepsis can be categorized into either early-onset sepsis (EOS) or late-onset sepsis (LOS). EOS usually appears within the first 72 hours of life, representing vertical mother-to-infant transmission, whereas LOS represents infection within the hospital environment or the community and appears at least 72 hours after delivery. For preterm infants admitted in a neonatal intensive care unit (NICU), the mortality rate of LOS can reach 11.3% . These infants are especially vulnerable to LOS due to their immature immune systems and prolonged hospital stays

The survival of preterm babies has significantly improved over the last several decades in the high-income countries because of the availability of Neonatal Intensive Care Units (NICU's) in both large and small hospitals, presence of specially trained physicians, nurses, and other health care personnel with easy access to sophisticated equipment. However, the bigger public health advances that saw improvements in socio-economic status of the populations, improvements in education and sanitation conditions and reductions in malnutrition and rates of infectious diseases were probably the main reasons for this improved survival rates for preterm neonates.

II. OBJECTIVES

To detect the early signs of sepsis in newborn babies, such as changes in vital signs, before the condition becomes severe.
To continuously monitor newborn babies for signs of sepsis, using IoT devices to collect and transmit data in real-time.
To improve the accuracy of sepsis diagnosis and reduce the rate of false positives and false negatives in newborn babies.
To personalize treatment plans for sepsis in newborn babies based on individual patient data, including medical history, gestational age, and response to treatment.
To automate the sepsis diagnosis and treatment process in newborn babies, reducing the burden on healthcare providers and improving efficiency.
To improve patient outcomes by reducing the incidence of sepsis-related complicationsand mortality rates in newborn babies

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III. LITERATURE REVIEW

This paper presents IoT based smart system that act as baby cradle monitoring system for engaged or working parent so that they can manage properly, and also for proper care and safety of the infant. Parent can recognize baby's movement, sound like crying and video output of baby's present position and motion will be visible on a screen monitor so the parent or any person can watch the infant even while away from baby. This cradle system is useful for monitoring or detecting movement and crying condition of the child automatically. The Raspberry pi B + module is used to have control on the entire hardware, condenser MIC is implemented for baby cry detection, PIR motion sensor is designed to identify baby's motion and pi camera is capturing the infant condition of motion and the display is used to show video output of sleeping baby. This smart baby monitoring system have n number of parameters such as live video and sound, set down audio and leisure movement of infant, measuring the room temperature and the humidity indicates if the baby is sleepless, and the most important characteristic is the ability to listen to the baby noise with cry detection feature.

IV. PROBLEM STATEMENT

Early-onset sepsis occurs within the first 72 hours after birth and is a major cause of neonatal morbidity and mortality worldwide.
Early diagnosis is difficult due to non-specific clinical symptoms and the rapid progression of the disease.
Conventional diagnostic methods such as blood cultures and laboratory tests are time-consuming.
Delays in diagnosis can postpone critical treatment decisions, increasing health risks.
Sepsis may remain undetected until it becomes severe, leading to serious complications or death.
Premature and critically ill infants are at a higher risk of adverse outcomes.
There is a strong need for an intelligent, real-time monitoring and prediction system for early sepsis detection.
Physiological sensors can continuously monitor vital signs in newborns.
Machine learning algorithms can analyze sensor data and clinical records to predict early warning signs.
Challenges remain in accurate data collection, processing, and interpretation of senso

V. NEXISTING SYSTEM

It is challenging to apply deep learning models in a real-time clinical situation since they are difficult to comprehend and take a great deal of processing resources.

Consequently, the proposed work focuses on machine learning-based methodologies with novel data processing paradigms that can be easily deployed in a clinical setup. 30,000 patients. The data used for both testing and validation is around 12.5 percent, which sums up to an approximation of 5,000 patient data.

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VI. PROPOSED SYSTEM

The proposed system introduces an intelligent, fully automated medical emergency alert solution with real-time monitoring and location tracking.It continuously analyzes vital signs and motion data locally to identify emergencies accurately.Upon detection, alerts and precise location details are transmitted instantly through a cloud-based IoT platform.

The system minimizes false alarms, reduces response time, and operates without user intervention. Designed for energy efficiency and scalability, it supports long-term deployment in homes, hospitals, and remote environments.

This approach enhances patient safety, ensures timely assistance, and integrates seamlessly with modern smart healthcare infrastructures for continuous reliable emergency care delivery across all scenarios.

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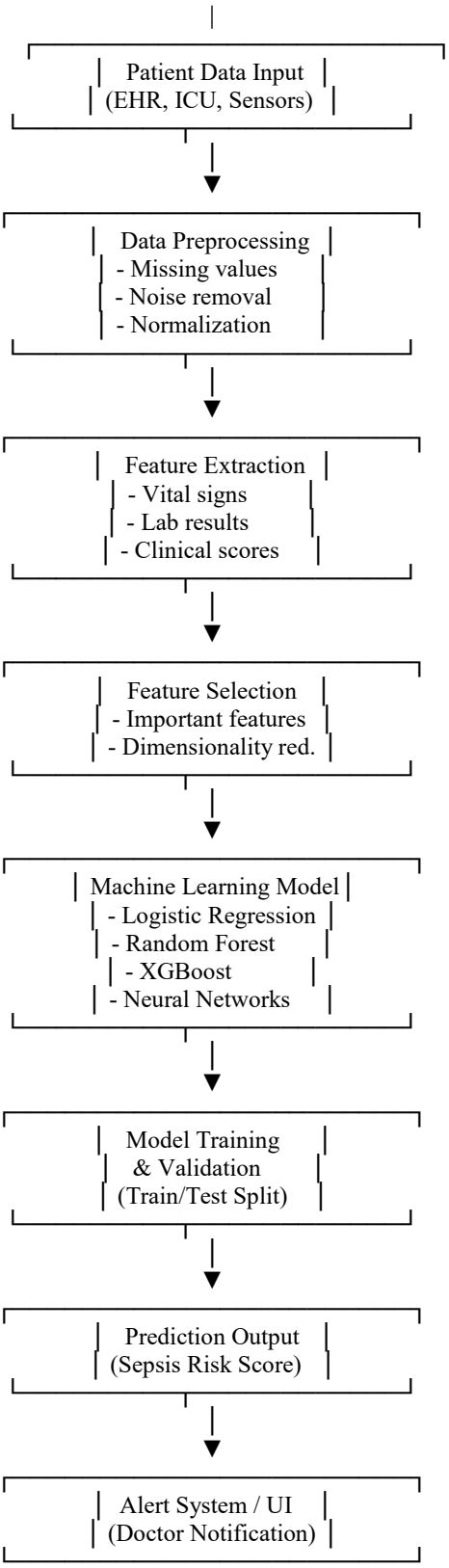
VII. BLOCK DIAGRAM

The overall working of the system can be represented using the following block diagram:



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VIII. HARDWARE COMPONENT.

Power Supply Unit
PIC16F877A Microcontroller
Heart Beat Sensor
ECG Sensor
Respiration Sensor
Force Sensor(cheast impedance)

IX. SOFTWARE REQUIREMENTS

MP LAB IDE SOFTWARE
Operating System
•Windows 10 / 11
•Programming Language
•Python 3.7
•Development Environment
VS Code
Machine Learning
NumPy ,Pandas
Dataset
Medical sepsis dataset (CSV format

X. CONCLUSION

Late-onset sepsis remains a significant challenge in healthcare, particularly in neonatal and critical care settings, due to its high mortality rate and difficulty in early diagnosis. Machine learning algorithms have demonstrated strong potential in improving the early prediction of sepsis by analyzing complex clinical data such as vital signs, laboratory results, and patient history.

In this study, various machine learning techniques were explored to develop predictive models capable of identifying patients at risk of developing late-onset sepsis. These models can assist clinicians in making timely decisions, thereby enabling early intervention and improving patient outcomes. Compared to traditional diagnostic methods, machine learning approaches offer higher accuracy, faster processing, and the ability to uncover hidden patterns in large datasets.

However, challenges such as data quality, class imbalance, lack of interpretability, and limited real-world clinical validation still need to be addressed. Despite these limitations, the integration of machine learning into healthcare systems holds

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